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ABSTRACT

This report addresses issues relating to the planning and development of educational programs for oral health personnel in World Health Organization (WHO) communities. Opinions and ideas were obtained from professionals in Sweden, Denmark, Canada, Botswana, Australia, Yemen, United Republic of Tanzania, Sri Lanka, Singapore, and Czechoslovakia. The approach taken for program development involves the study of community demand, which is the most reliable way of ensuring that programs meet the needs of the real population. Accordingly, the assessment of oral needs of communities and the planning of oral health services are discussed before educational requirements are considered. Examined in detail in individual chapters are: (1) manpower planning for oral health; (2) identification of educational objectives; (3) design of educational programs; (4) program implementation; and (5) evaluation of educational programs for oral health personnel. (CB)

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The Planning and Development of Educational Programmes for Personnel in Oral Health

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PREFACE

Experience in many industrial and developing countries has shown that a study of community demand is the most reliable way of ensuring that educational programmes meet the real needs of the population; thus the planning, implementation, or revision of training programmes in oral health must be oriented to the real problems of the community. The application of this approach will be an ongoing activity since the skills required by various categories of oral health personnel may change fundamentally during their normal working life.

The philosophy of this approach is discussed in detail in this manual, and examples are given of how to establish or modify a training programme so that it meets the objective of solving the oral health problems of a nation or of component population groups. A planner must realize that the training of dental personnel is an integral part of the whole oral health system of a community. As that system changes, so the dental education provided must be modified to meet the changing needs.

A joint WHO/FDI working group was established in 1978 to discuss a draft manuscript prepared by the authors on the planning and development of educational programmes for oral health personnel. This draft was revised with the assistance of several specialists from different countries: Dr G. Anneroth (Sweden), Dr G.S. Beagrie (Canada), Dr M. Condon (Botswana), Dr A. Frandsen (Denmark), Dr N.L. Henry (Australia), Dr S.A. Hussein (Yemen), Dr C. Luhanga (United Republic of Tanzania), Dr D.Y.D. Samarawickrama (Sri Lanka), Dr C. Sundram (Singapore), and Dr F. Urban (Czechoslovakia).

The final version of the manuscript was discussed at a meeting of the working group held in London, on 12-16 October 1983; this meeting was attended by Dr J.E. Ahlberg, Dr H. Allred, Dr D.E. Barmes, Dr M. Condon, Dr M. Hobdell, Dr P. Leous, Dr C. Luhanga, and Dr D.Y.D. Samarawickrama.

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CHAPTER 1

INTRODUCTION

Every oral health service depends on the number, type, and quality of its personnel and therefore on their educational background. The aim of this manual is to provide a starting point for planners of oral health services and of educational programmes for oral health personnel to help them solve the particular problems they face. It is assumed that the number and type of personnel trained and the curricula designed for their vocational education will be adapted to meet the oral health needs of the community as a whole. Many curricula have been published in the past and the present authors are aware of the dangers inherent in using a curriculum that was designed to train personnel for different circumstances.

On a national scale, oral health care has always been provided by a "team". However, this term can have a number of different meanings: the large team that provides a national service; a smaller team that meets the demands of a province or district; or the smallest operational team which may consist of a village health worker and his or her supervisor. The concept of the health team has been further expanded as the practical implications of the primary health care approach, at the local level, have emerged over the past few years. Similarly from an educational viewpoint there have always been "teams" of people concerned with the planning, the organization, or the execution of programmes.

In this manual the education and training of a range of personnel are discussed. Various categories of oral health personnel have evolved over the years, generally on an ad hoc basis; this evolution has been influenced by epidemiological, financial, traditional, cultural, social, and political factors as well as by the availability of manpower; all these factors will vary from time to time within any one country as well as between countries. Therefore, oral health planners and educators must adopt a flexible approach so that they can respond appropriately to

change. A single educational programme can neither be universal nor permanent. In addition, the difficulty, at any one time, of accurately predicting what will be required of the oral health work force in the future emphasizes this need for a flexible approach, and the necessity to plan for the continuing education of oral health personnel.

In principle, each community will require its own system of education to train the oral health personnel who will provide care for the entire community and not just for a small elite group. From the outset, therefore, the quality of the educational process inevitably has a quantity component. It will be necessary for the required number of oral health workers to be educated in a way and at a rate that the community can afford and accept. The provision of good-quality care will therefore depend on more than simply a high level of education and the ability to apply technical skills.

Dental teams should be created that are capable of (1) using preventive methods to maintain oral health and (2) treating disease using both simple and more complex procedures. However, oral health education and oral health services will have to compete with other health priorities for a nation's resources; therefore both processes should be efficient. Training to a level above that which is required to fulfil a given role not only wastes resources but also causes dissatisfaction among the personnel concerned. An additional problem is the tendency for individuals to want to perform tasks perceived as representing the peak of their profession and to concentrate on these to the detriment of other, perhaps more important, tasks. This is particularly serious when operative procedures take precedence over preventive procedures.

The economics of different systems of education and service have not yet been properly researched. Although considerable data exist to indicate the cost-benefit aspects of many preventive procedures in dentistry, few such data are available for curative/restorative/ rehabilitative procedures, or for the different systems used to provide such services; as regards the education of oral health personnel, these

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questions are rarely even asked. The constant need to question and assess the efficacy of any system is clearly of paramount importance. It is obvious that if a community trains people specifically to reduce the prevalence of cavities in teeth then the service provided will be dominated by curative work. In planning and designing curricula for oral health personnel it is first necessary to study the oral health needs and, if possible, the oral health trends of the communities they are to serve in relation to the resources available. In this book, therefore, the assessment of the oral health needs of communities and the planning of oral health services are discussed before educational requirements are considered.

1.1 Overall hypothesis

The overall approach recommended can be summarized as follows:

> "Oral health care will be the responsibility of specially designed teams whose members will be trained together to combat oral disease on a community scale. The size and composition of each team will be determined by the needs of the community it will serve. The teams will be led by one or more "dentists" who will be educated and trained to exercise overall control of patient care, to diagnose, to prescribe treatment, to check and supervise simple procedures at least at an overall community level and to carry out the more complex operations demanding their unique skill and training."[1]

But what is understood in this context by the terms "community", "dentist", and "team"?

(a) A community may be defined as a whole nation; a section of a nation identified by age or geographical location; or a small unit that one dentist might care for alone.

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[1] ALLRED, H. et al. Proposals for planned change in dental education and practice. British dental journal, 133: 173 (1972).

(b) A dentist may be defined as an individual with the training, knowledge, and experience commonly identified with that title. On the other hand, a dentist may be a physician who is required to accept responsibility for oral health care as part of general health care.

(c) A team may be defined, variously, as a large group of dental auxiliary personnel trained for a specific role who provide service throughout a country; a composite group of health, social, educational, as well as dental personnel, who are required to provide oral health care on a community scale; or a small group of specialist dental personnel.

Two generalizations provide the foundations on which this book is based:

(a) The oral health care of the community should be provided by a team that is ultimately responsible to a dentist or a physician. No section of society identified by age, oral state, or their own perceptionlof their need, should be denied the expertise and knowledge of the most highly educated member of the team. Overall diagnoses based on epidemiological data and appropriate prescriptions should, in principle, be made by dentists or physicians who can then delegate tasks as appropriate. They will retain ultimate responsibility, however, for the care provided. This does not necessarily imply that every type of dental auxiliary must work at all times directly under the day-to-day supervision of either a dentist or a physician.

(b) The quality of the dental care provided on a community scale has a quantity component. Therefore, in the interests of society, dentists should be able to delegate to auxiliary personnel much of the repetitive, simple, time-consuming, work. Auxiliaries must therefore be capable of carrying out these delegated tasks, and the health authorities should consider the cost-benefit aspects of this delegation.

CHAPTER 2

MANPOWER PLANNING FOR ORAL HEALTH

This chapter outlines how and why educational programmes for oral health personnel should evolve in step with the needs of society so that they will be specific to that society at a particular time. Since societal needs may change, educational programmes should also be adaptable. A need for change becomes evident when educational programmes produce oral health personnel with skills that either do not match the oral health needs of society or are not in tune with the available resources. Early recognition of such an imbalance is important and there should be continuous evaluation of the effectiveness of both educational programmes and the strategies for oral health.

2.1 How to start

The education of oral health personnel, like that of any group of workers, cannot occur in a vacuum. Educational programmes and courses are devised to train a corps of personnel and to equip them with the skills necessary to fulfil a specific and essential role within the community; health care training programmes are no exception to this rule. However, since the patterns of oral disease differ between communities the problems encountered by oral health personnel also vary. Furthermore, from time to time, changes occur in the patterns of disease so that a single training programme can be neither universal nor permanent.[1,2]

The teaching of dentistry, which is a technical and scientific subject, should also include some training in the social sciences and

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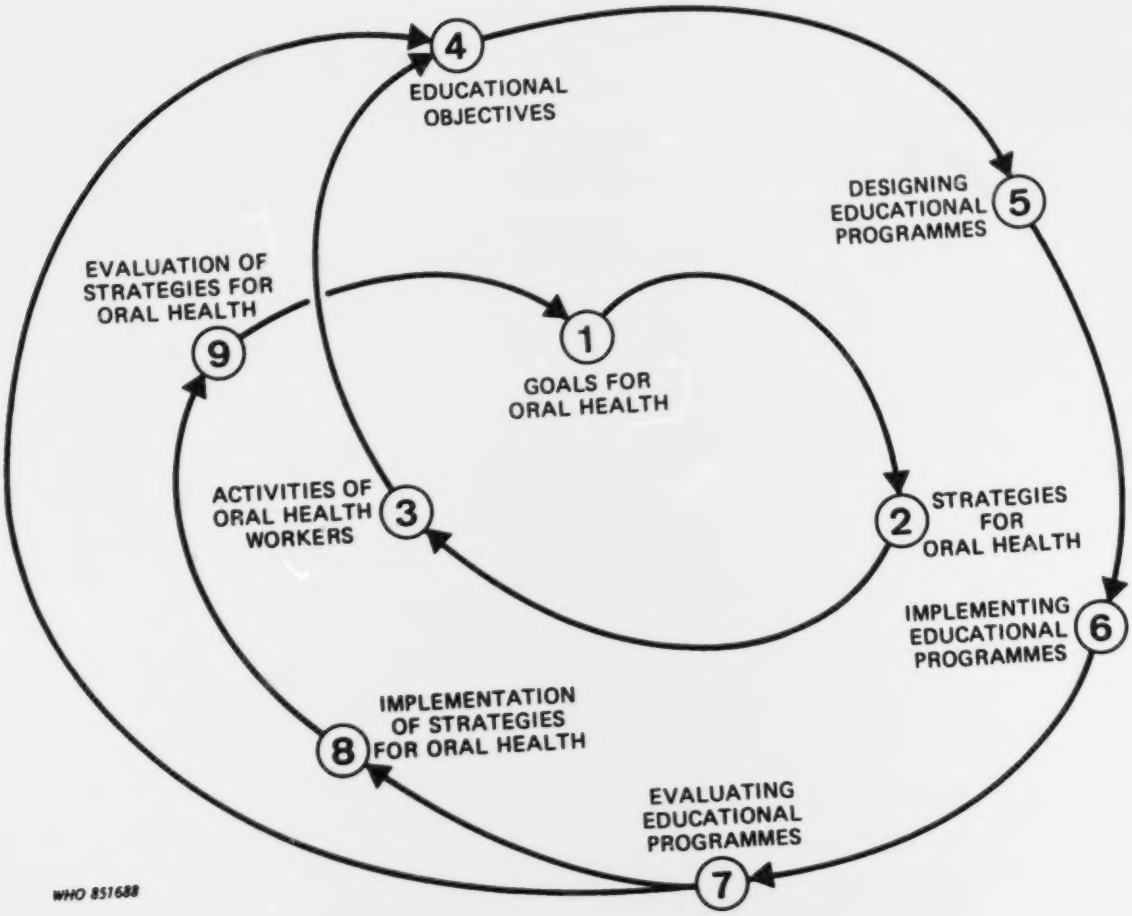
[1] Oral health surveys. Basic methods, 2nd ed., Geneva, World Health Organization, 1977.

[2] Planning oral health services. Geneva, World Health Organization, 1980 (Offset Publication, No. 53).

Fig. 1. The educational spiral



should reflect the social, political, and economic characteristics of the community. The same considerations should be taken into account in designing training programmes for oral health personnel.

The preparation of an educational programme cannot be the starting point for manpower planning. There must first be a recognition that an oral health problem exists or is likely to exist in the future. These problems may manifest themselves in a number of ways, for example:

- a large number of cases of untreated dental caries, periodontal disease, malocclusion or oral cancer may result in population demands for action;

- the chief dental officer of a country may complain that he or she has a relatively large number of unemployed, highly-trained dental personnel because of a reduced level of dental caries among younger age groups;

- there may be a high level of dental disease, and an adequate number of oral health workers but equipment and/or materials may be in short supply.

2.2 The first steps in planning educational programmes for oral health personnel

The various stages of educational planning may be visualized as a branching, continuous spiral as illustrated in Fig. 1. Components 1, 2, and 3 of this spiral are discussed in this chapter, component 4 in Chapter 3, and components 5, 6 and 7 in Chapters 4, 5 and 6, respectively.

The development of a programme that includes a careful analysis of the situation in which the personnel will work, will involve the following nine initial actions:

- Identify factors influencing the design of educational programmes for oral health workers.

- Record data as a situation analysis.

- Draw conclusions and identify problems.

- Set feasible and measurable short-term and long-term goals for oral health programmes.

- Review possible strategies for oral health.

- Identify the implications of possible strategies.

- Select the best possible oral health strategy.

- List in order of complexity the activities of oral health workers that are implicit in the selected strategy.

- Identify the activities that are appropriate for the various types of oral health worker.

Each of these factors will be discussed in the following sections of this book, together with outlines of the methods suitable for collecting, collating, and analysing the data required to define the situation for which the educational programme is being planned.

2.2.1 The factors in a community that give direction and shape to oral health training programmes

If the oral health needs of a society are to be matched with the available national resources to provide care, then it is necessary to define the term "needs". In this context it is not a simple concept, since the need for oral health care must be distinguished from the demand for care, i.e., the use of services.

Need may be defined as an informed and competent prescription of effective and acceptable treatment for a diagnosed oral disease or disability.

Demand is the level of requests for treatment made by individuals who consider that they have an actual or potential oral health problem.

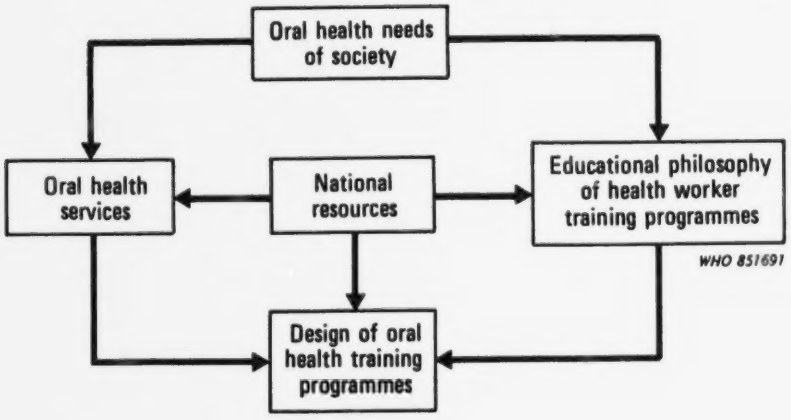
The consumer demands on health services may or may not coincide with the health provider's perception of the population need. However, consumers may not agree that they have any need for oral health care at all. Neither needs nor demands are absolute, concepts of both may differ. For example, when faced with a patient with a fractured upper central incisor one provider might prescribe root-canal therapy and a post-retained porcelain crown, while a second provider might extract the tooth and provide a removable prosthesis instead. The patient could "demand" either course of action. Many factors influence both the needs and the demands for care: the needs are influenced by the education of the person carrying out the diagnosis, the skills of the operator, the prevailing treatment policy, the pressure of work, the availability of auxiliary support and materials and of equipment and the system of remuneration; the demands for care are influenced by the availability, accessibility, and acceptability of services as well as by an awareness of what might be possible.

All countries provide some form of oral health service. These are staffed by personnel who have participated in various types of educational programme and who have their own concepts of the oral health needs of society and the educational requirements for oral health personnel. Furthermore, they will have a view of their own future role and they are a major asset to a society that is planning and implementing any educational programme.

However, it is important that every country look beyond its own frontiers to determine the current educational philosophy elsewhere

regarding the training of oral health personnel; the aim of this manual is to assist in this process. A study of the job descriptions and the educational requirements prescribed for oral health personnel reveals, if only in their abundance and variety, the range of possible solutions. Fig. 2 summarizes the community factors that influence training programmes.

Fig. 2. Factors in a community that influence training programmes


Oral health needs of society
Oral health services
National resources
Educational philosophy of health worker training programmes
WHO 851691
Design of oral health training programmes

2.2.2 Data recording and situation analysis

The details of the data to be recorded and how they can be obtained to provide a situation analysis are given in a previous WHO manual[1] (see also Annex 1). One such situation analysis prepared for a country in 1979 is reproduced in Fig. 3, other examples are given in the manual mentioned above. Ideally all the required data should be available but this is not usually the case; however, it is important that as many data as possible are recorded if an analysis of the situation is to be made with any confidence.

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[1] Planning oral health services. Geneva, World Health Organization, 1980, pp. 5-8 (Offset Publication, No. 53).

Fig. 3. A situation analysis prepared for a country in 1979

1. Population estimates

Category	1973 Census	1979 projected	1984 projected
TOTAL	14 902 894 – 55.6% <20 years	16 935 000	18 193 000
Urban	2 697 659		
Rural	10 582 538	Estimated 2.5% increase per annum	
Nomadic	1 622 697		
School age	2 225 000[a]		
At school	1 589 833		

[a] Approximately 17% of the urban and rural population.

2. Number of schools and schoolchildren 1976/77

	Provinces visited				Age range (years)
	1	2	3	4	
Primary	6597 – 307 040	447 – 169 394	932 – 255 529	202 – 16 718	7–12
Junior secondary	897 – 218 627	155 – 37 305	291 – 53 594	20 – 6 937	13–15
Senior secondary	102 – 64 166	31 – 14 282	37 – 15 506	2 – 849	16–19

3. Economic data

Per capita income: $112.07 (1972)
Total Government resources: $603 735 632 (1972/73)
GNP: $220 075 200 (1971/72)

4. Health personnel

General				Oral		
Budget	1974/75	US$64 210 163				
Personnel	1975			1979		
Physicians	Senior and specialist	395	1287	Dentists	Senior and specialist 8	191
	General	892			General 183	
Other	Medical assistants	1 579	18 556	Dental assistant	169	
	Nurses, midwives, etc.	16 977		Dental technician	16	
				Nurses	50	

NB: 169 dentists and 155 dental assistants in Ministry of Health;
≈ 100 dentists in part-time and 11 in full-time private practice.

5. Training facilities

General			Oral		
Training					*Annual output*
Medical schools	2	1979	Dental school	1	20
Medical assistant schools	6	1979	Dental auxiliary school	1	20
Nursing schools	54				
Village midwife schools	18	1974			
Health visitor schools	3				

NB: A further 20 dentists per year graduate from foreign dental schools.

6. Health facilities

General		Oral	
Facilities			
Hospitals	171	Hospitals	1
Health centres	144	Dental departments	
Dispensaries	634	Dentists and assistants	23
Dressing stations	1505	Assistants only	≈ 19
School health service units	11	Health and school centres	21
Public health officer	225		
Other	32		

NB: In the South there are 12 dental departments of which 9 have assistants only.

7. Oral disease data

Caries 12 years

	No.	D	M	F	DMF
Capital	80	1.14	0.15	0.04	1.33
2nd city	40	1.30	0.10	0.00	1.40
3rd city	40	0.35	0.00	0.00	0.35
Total	160	0.98	0.10	0.02	1.10
Population weighted total					1.15

Caries 15 years

	No.	D	M	F	DMF
Capital	80	2.15	0.33	0.09	2.56
2nd city	40	1.98	0.30	0.00	2.28
3rd city	20	0.35	0.00	0.00	0.35
Total	140	1.84	0.27	0.05	2.16
Population weighted total					2.04

Periodontal disease 12 years

	No.	No. segments with:			
		Deposits	Calculus	Gingivitis	Adv. cond.
Capital	80	3.6	1.2	1.5	<0.1
2nd city	40	3.9	2.4	2.0	0.1
3rd city	40	3.6	2.9	1.9	0.1
Total	160	3.7	1.9	1.7	0.1

Periodontal disease 15 years

	No.	No. segments with:			
		Deposits	Calculus	Gingivitis	Adv. cond.
Capital	80	3.4	1.9	2.0	0.2
2nd city	40	3.1	2.0	2.1	0.1
3rd city	20	2.3	1.9	1.3	0.0
Total	140	3.1	1.9	1.9	0.2

8. Treatment needs

	12 years				15 years			
	Capital	2nd	3rd	Total	Capital	2nd	3rd	Total
No.	80	40	40	160	80	40	20	140
Fillings:								
single surface	0.96	1.08	0.33	0.83	1.75	1.45	0.35	1.46
multiple surface	0.12	0.13	0.03	0.10	0.29	0.40	0.00	0.28
Crowns	0.03	0.08	0.00	0.06	0.06	0.08	0.05	0.06
Extractions	0.06	0.10	0.04	0.06	0.06	0.05	0.00	0.05
Prosthetic cases	–	1	–	1	4	1	–	5
% Periodontal care								
hygiene instruction	33	13	8	21	13	15	0	11
scaling	51	73	80	64	61	60	60	61
other	3	5	0	3	6	8	0	6
% Orthodontic cases	8	13	0	7	16	13	0	13

Utilization: 12 years – 3% Juba, 25% elsewhere; 15 years – 5% Juba, 20% elsewhere.
Dentofacial anomalies: 12 years – 19%, 15 years – 31%, but 7% and 13% needing care, respectively.

9. Service data

	Attendance	Fillings	Extractions	Scaling & prophylaxis	Full dentures	Partial dentures	Crown & bridge	Repairs & relining	Orthodontics	Fractures, minor surgery, and root canal treatment	Other
General service											
Northern region	250 000[a]	38 831	167 365	2 741	5 275	11 500	DATA	UNAVAILABLE	560	1 965	119 723
3rd city	10 050	200[b]	3 000	600[c]						250	6 000
School dental service											
Capital – screening	13 337	–	–	–	–	RESTRICTED TO CAPITAL AND PRIVATE PRACTICE					
– care	8 095	2 283	4 212	–	–						1 648

[a] Estimate based on about three-quarters of all treatment data; actual attendances not recorded. [b] Temporary only. [c] Periodontal cases, but no scaling possible owing to lack of instruments.

2.2.3 Drawing conclusions from the analysis of the situation and problem identification

The development of appropriate training programmes for oral health personnel will depend on whether usable conclusions have been obtained from the analysis of the situation. This process will identify not only what is needed to meet the oral health requirements of the population but also the important mismatches that exist between those needs and the resources available. The aim of the process of drawing conclusions is to devise possible ways of overcoming such mismatches by selecting the most effective and practical solution. The solution chosen must embrace a manpower development plan and a preventive programme as well as details of the on-demand and systematic care to be provided.

2.2.4 Goals for oral health

To resolve the mismatches referred to in section 2.2.3 and the problems they reveal, it is necessary to decide what it is possible to achieve, i.e., to define goals. It is convenient to consider two time periods within which goals are to be achieved: 3-5 years (a relatively short period) and 10-20 years (a relatively long period - at least in health terms). The goals should be both specific and measurable for the most common problems occur when they are only vaguely defined (leading to confusion) and are over-optimistic (leading to disillusionment and the early abandonment of the plan). Carefully stated goals not only give direction to training programmes, but also provide important reference points against which the effectiveness of the programme itself, as well as the entire integrated oral health plan of which it is a part, can be assessed.

There are a number of ways of defining measurable oral health goals. The following section summarizes the most common.

The measurable oral health goals for integrated planning should be defined as a percentage of the population group being considered or by

using other appropriate numbers. Some of the topics for which goals should be established are listed below:

(1) Prevention goals

(a) Caries

Population group: 12 years of age

- target date;
- stated DMF figure (decayed, missing, and filled permanent teeth);
- percentage free of caries.

(b) Periodontal disease

Population group: 15 years of age

- target date;
- stated percentages or mean sextants per person with gingival bleeding, calculus, and pocketing.

(c) Oral hygiene

Population: all age groups

- target date;
- percentage practising defined oral hygiene activities.

(d) Teeth present

Population group: 35-44 years of age

- target date;
- mean number of teeth present;
- percentage of population group totally edentulous.

(2) Service goals

(a) Services on demand

Population: all age groups

- target date;
- percentage seeking such care.

(b) Systematic care

Population: each age-group to be defined

- target date;
- percentage to receive such care;
- definition of the type of care;
- specification of the quality of care.

(3) Manpower goals

(a) Production

- target date;
- specification of the types of oral health personnel;
- production number for each type;
- number of each type in service.

(b) Distribution

- target date;
- identification of services;
- number of each type in each service by region or district.

2.2.5 Possible strategies to achieve defined goals

A strategy is a series of integrated activities to be followed to achieve defined goals. Its creation presupposes a knowledge of possible options and it needs to be related to a number of variables. Some of these variables are detailed below:

(1) The target group (or groups) for whom the strategy is designed, e.g., all the pupils in the first five years of primary school; all the pupils in the first year of primary school; all the pupils in the final year of primary school.

(2) The time available to achieve the introduction of each activity, e.g., within one year, five years, twenty years.

(3) The activities themselves:

- emergency dental care for the primary dentition by the extraction of teeth;

- conservative dental care only on demand for the permanent dentition;

- conservative dental care for both dentitions provided every six months;

- conservative care for both dentitions provided every six months and orthodontic, or prosthetic care available as appropriate;

- piped water fluoridation;

- group fluoride brushing or rinsing;

- health education.

(4) The personnel to be involved in the activities:

- for piped water fluoridation: engineers, plant and laboratory technicians;

- for health education: school teachers, parents, primary health care workers, public health personnel, volunteers;

- for conservative dental care: dentists, dental auxiliaries.

2.2.6 The implications of possible strategies

In the previous sections the goals for oral health services have been determined and the strategies by which these goals may be achieved have been considered. In this section the possible ways of implementing

each of the possible strategies wil be examined in depth. For each task or activity the following series of questions can be posed:

- what is the activity?

- who will be responsible?

- where will it be done?

- what are the legal implications?

- how much will it cost?

- who will provide the necessary guidance?

- are there any other consequences?

Each task will inevitably involve many aspects. To illustrate this complexity an example is given below. The task chosen as an example is fluoride mouth-rinsing by primary school children. A series of individuals will be responsible for instructing, directing, approving, teaching, and supervising such an activity, e.g., minister of health, chief dental officer, community dental officers, community dental auxiliaries, minister of education, school teachers, parents.

Then it has to be decided where the activity will be carried out - perhaps in the primary schools. The legal implications of the proposed activity must also be considered; for example:

- does it comply with the laws on drug safety?

- will parents be required to give written/verbal permission and if not how will their children be protected from involvement?

- is the activity permissible under existing legislation?

In addition, an assessment will have to be made of the various costs involved such as the training costs and the salaries of those involved; the capital outlay for equipment; and the costs of material and travel. Associated with this cost assessment will be the question of who will provide the necessary finance. Sources of finance may include: the central government through a special grant; the local health authorities from existing resources; or private funding. Finally, any additional consequences of the activity must be assessed, e.g., loss of teaching time.

Once all the above assessments have been completed for this first-level activity (i.e., fluoride mouth-rinsing by primary school children) then a second level of activities must be considered. For example, assuming that the staff designated to operate the programme on a routine basis have been defined, e.g., school teachers and dental auxiliaries to supervise, it will be necessary for these people to:

- order materials and supplies;
- prepare enough fluoride solution of the correct strength;
- dispense the correct volume of solution into individual containers for each pupil;
- check those in class and note absentees and newcomers;
- check that a suitable time-interval has elapsed between the present rinse and the previous one;
- check that all those taking part have, where necessary, parental consent;
- demonstrate to newcomers the rinsing method;
- time rinsing and check that it is done properly;

- clear away all apparatus and materials;

- liaise with other staff on administrative matters.

A third level of activities may evolve from these second-level tasks. For example, for the preparation of enough solution of the correct strength these additional tasks would involve:

- calculating the amount of solution needed;

- making up the standard strength solution;

- making certain that there is an adequate supply of the raw materials;

- providing security against misuse of materials.

2.2.7 How to select the best solution

In the previous sections a systematic review has been presented of possible strategies and their many implications. With this knowledge, it is important to review judgements about the constraints, obstacles, and consequences associated with the various strategies to confirm their continued validity. The following is one way of accomplishing this:

(1) Review all the major strategies to be considered in relation to the background material gathered during the situation analysis.

(2) List, for each strategy, the important effects and the factors that will act as constraints to achieving them, noting the real obstacles and the likely consequences.

(3) Establish priorities among the goals set, taking into account their context in the programme that is to be established.

(4) Summarize the information obtained under the following headings:

(a) Service content: e.g., preventive activities; the use of fluoridated water; or a mouth-rinsing campaign in the primary schools.

(b) Staff changes/requirements: e.g., the number and type of staff needed at each stage of the programme.

(c) Costs: prepared as thoroughly as is possible and in a standardized way.

(d) Constraints: e.g., lack of reliable dental equipment.

(e) Obstacles: e.g., changes required to state or national legislation.

(f) Consequences: these should include not only the oral health consequences, but also other health or community effects.

The compilation of such a review for each possible strategy will frequently eliminate some of them, for example, because of higher costs than originally anticipated. However, the most appropriate strategy will incorporate activities that will achieve the defined goals despite the constraints of the actual situation. In addition, an evaluation of the chosen strategy must be incorporated into the decision to launch it. There should be a mid-term evaluation, e.g., at the end of five years to allow for mid-term modifications to be made and timely replanning, and a final evaluation, e.g., at the end of the ninth year. Evaluation should consist of a survey, a review of the records, and a report on matters such as the coverage and monitoring activities.

2.2.8 Listing activities in order of complexity

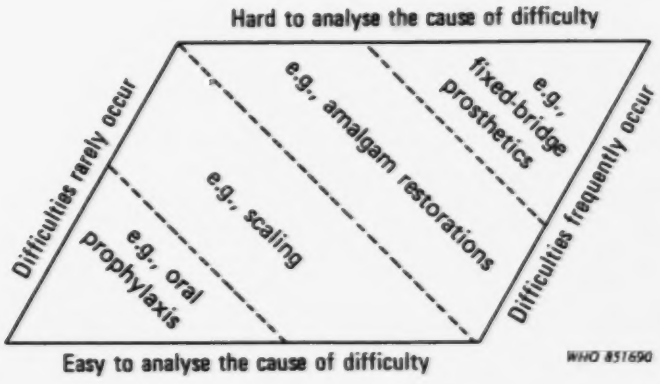
Before it is possible to determine the types of oral health personnel required it is necessary to list all the activities in appropriate detail. Each activity should be considered using two criteria:

(1) How frequently do problems or difficulties (deviations from the "average" or "normal" predicted solution) arise during this activity?

(2) If problems or difficulties do arise, how easy is it to determine why they have done so and to correct them?

Using these criteria, activities may be listed in order of complexity (see Fig. 4).

Fig. 4. Listing activities in order of complexity



Using this format as a guide it is possible to list all the activities required for the execution of a strategy according to their potential difficulty and complexity of analysis. Those activities that cause the most problems and are the most difficult to analyse and correct should be given to those workers who have received the special training required to deal with them; this frequently means workers with experience and training in a broader spectrum of oral health care.

2.2.9 The identification of activities appropriate for various types of oral health personnel

Lists of such discrete tasks as have been discussed previously and which are components of the activities outlined in a selected strategy, will eventually be needed during the development of a training programme. But first it is necessary to decide how to divide the work so that it is all accomplished and so that the roles of different types of personnel can be integrated into a team effort aimed at achieving the stated goals.

The way in which these various activities are assigned to different types of worker varies between countries. There does not seem to be one absolute or correct division. Each country has its own job descriptions and nomenclature for dental staff; this is apparent in the WHO publication The training and use of dental auxiliary personnel[1] (and it is even more apparent when non-European countries are also considered). For example, one type of oral health worker is named a "chairside assistant". In 19 countries no less than 30 "items of work" are associated with this type of worker but in no two countries are they the same; the number of different tasks varies from six to 15 in different countries. Specifying the work responsibilities considered to be appropriate for each category of staff is an essential preliminary step during the consideration of education requirements (see Chapter 3).

In an oral health service, it is better to have a combination of various types of personnel with complementary skills rather than a single type of personnel who tend to specialize a great deal and thus narrow the spectrum of activities provided. However, certain anomalies exist that can hinder the work of one or other group and such divisions should be avoided. For example, if as part of one group of activities, certain auxiliary oral health workers are responsible for restoring the primary

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[1] ALLRED, H. The training and use of dental auxiliary personnel, Copenhagen, WHO Regional Office for Europe, 1977 (Public Health in Europe, No. 7).

dentition they should also be trained and permitted to administer appropriate local analgesia. To split the two activities, as occurs in some countries, creates an unnecessary dependence of one group of workers on another and results in an inflexibility in possible staffing combinations. The possible types of personnel including health workers, oral health workers, teachers, parents, etc. for various programmes such as prevention, are given in Table 6 of a previous WHO publication.[1]

Similar, sometimes identical services may be provided by different types of oral health personnel. It is important that those who are planning changes, of whatever kind, within oral health services know which is the most appropriate type of personnel to provide each different part of the service. This requires a good knowledge of the combinations of tasks required to achieve the defined goals.

In most countries, dentists are principally concerned with the clinical aspects or activities of oral health and it is in this area where the more complex problems occur most frequently; these activities are often difficult to analyse while other oral health workers tend to be involved in less problematical activities. Fig. 5 illustrates a way of listing the activities that are appropriate for various types of oral health personnel.

The possibility of dividing activities between different types of personnel, who then cooperate with increased effectiveness and efficiency, should be considered. For example, when much restorative care is needed close support (four-handed) methods of operating may be employed to considerable advantage but when only very limited restorative care is to be provided such methods may prove to be expensive.[2]

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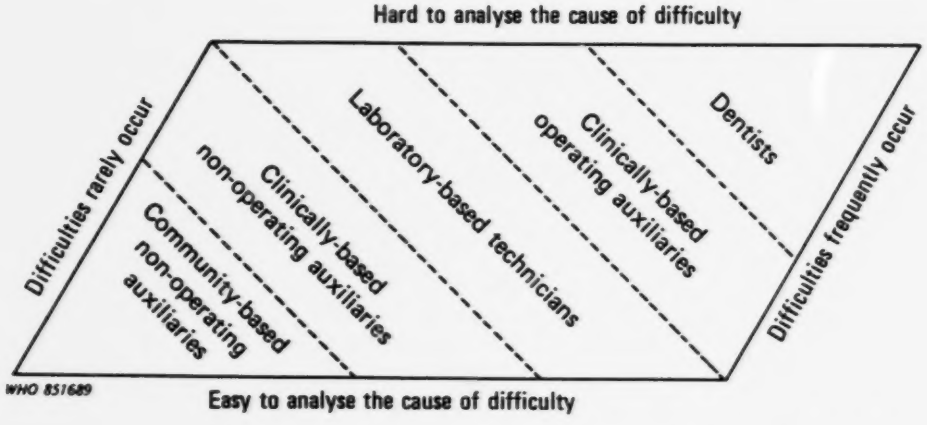
[1] Planning oral health services, Geneva, World Health Organization, 1980 (Offset Publication, No. 53).

[2] ALLRED, H. An assessment of the quality of dental care. London, The London Hospital Medical College, 1977.

In the final analysis, epidemiological data should form the basis on which a service is planned. Such data together with the monitoring of records provide the means by which the effectiveness of that service can be evaluated. However, it must be remembered that survey and monitoring systems must be simple, inexpensive, and rapid if they are to form the essential, up-to-date planning base that every community needs.

The implementation of a given plan and strategy for oral health will be achieved through the creation of oral health teams, defined in terms of the activities of their individual members. The methodology described in an experimental dental care project will permit the accumulation, over relatively brief periods, of information essential to the evaluation of an established strategy. This is an important point to be remembered when considering the need for research in dental education (see section 4.5).

Fig. 5. Listing activities appropriate for various types of oral health personnel



CHAPTER 3

IDENTIFICATION OF EDUCATIONAL OBJECTIVES

3.1 The educational spiral

In Chapter 2 the first three components of the educational spiral (section 2.2) were discussed. In this chapter component 4 of the spiral (educational objectives) is considered. This is the first true educational phase of the exercise which begins and ends with goals for oral health.

3.2 Defining educational objectives

Education is a process aimed at changing human behaviour and may be defined in terms of certain specific objectives. These are statements of what students should be able to do faced with particular situations under specific conditions. They relate directly to, and are derived from, the professional activities discussed in section 2.2.8. They define what students should be able to do at the end of a training/learning period that they could not do before. Educational objectives are "learning objectives" as opposed to "teaching objectives", since they define what the student, not the teacher, should be able to do. The objectives of a course are determined by the result required; they are not a summary of the programme or the means by which these results are to be achieved.

The attainment of educational objectives forms the basis for the evaluation of a programme. Adapting these objectives should be a way of ensuring conformity between training programmes on the one hand and the oral health needs and resources of a population on the other. The appropriateness of the educational objectives can only be verified using a valid means of evaluation - this being the next step in programme planning; therefore one must be able to measure the educational objectives against given criteria.

When defining educational objectives, as with other matters discussed in this manual, it is essential that the following are considered: the health needs and resources of the society; the established health professions; the progress of science; the capabilities of students; the social and cultural context, etc. Moreover, these factors should be considered prospectively since the personnel are being educated to meet future needs.

3.3 Types of educational objective

In section 2.2.6 it was shown that the consideration of each possible strategy initiates a series of subsidiary questions. Similarly, the more specific the job description for each type of personnel, the longer the list of educational objectives becomes.

Educational objectives may be grouped into three categories:

(1) General objectives - these correspond to the functions of the type of health personnel trained in an establishment;

(2) Intermediate objectives - these correspond to the component activities of each function;

(3) Specific (or instructional) objectives - these correspond to (or are derived from) precise tasks the results of which can be observed and measured against given criteria.

Thus, it is clear that each general objective includes a number of intermediate objectives which in turn involve numerous specific objectives.

3.3.1 General educational objectives

These objectives relate collectively to the student population of an establishment; they may be student dentists or dental auxiliaries or

primary health care workers. A few examples of general educational objectives are given in Annex 1 and many more are included in a Council of Europe publication.[1] The following example outlines the general educational objectives of a dentistry course.

On completion of their education, students of a dental school should be able to:

- recognize the patterns of health and disease in their country and the relevant priorities;
- provide preventive oral health care to all sections of the community;
- consider health rather than being preoccupied with disease;
- provide simple restorative care to all sections of the community;
- consider not just individual patients but also the family and the community;
- plan oral health services for both communities and individuals;
- act as members of a wider health care team of physicians, dentists, nurses, dental auxiliaries, social scientists, etc.;
- collaborate with other specified services;
- continuously develop their own skills in oral health care;
- contribute to advancing knowledge in oral health care;

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[1] Role and training of auxiliary dental staff in the Member States of the Council of Europe and Finland. Strasbourg, Council of Europe European Public Health Committee, Coordinated Medical Research Programme, 1981.

- develop the skills needed to educate oral health personnel;

- make the best and most effective use of the financial and material resources available.

Understandably, general educational objectives have certain common characteristics all over the world. It is not surprising that dentists and indeed all health workers should have similar general functions in every country, such as treatment, prevention, planning, education of the public, etc.

Real differences between the various professional groups become apparent from a consideration of the more detailed lists of intermediate and specific objectives, the latter having real meaning only through their relationships and interdependence.

3.3.2 Intermediate educational objectives

Within Europe the general oral health requirements as well as the resources available are not as disparate between countries as is the case in the rest of the world. Therefore, it has been possible to draw up an acceptable general list of the types and roles of oral health personnel considered to be appropriate, as well as the general and intermediate educational objectives for their training.

The following are examples of proposed intermediate objectives for newly graduated dentists who will work in a situation where resources are plentiful and auxiliary staff are available. These newly qualified dentists should be able to:

- list the roles of all types of dental personnel and the principles of team work;

- communicate effectively and efficiently with members of the dental team;

- protect the safety and comfort of patients;

- delegate work appropriately to dental auxiliary personnel within the team and organize and lead the team effectively and efficiently;

- design a clinical environment appropriate to the needs of different types of dental team and the care they provide;

- list the basic principles associated with the training of dental auxiliary personnel in team work.

There will be obvious differences in the defined intermediate and specific educational objectives in situations where marked differences exist between communities in the pattern of oral disease, the resources, the social and political systems, and the types of existing health service.

A wide variety of educational objectives identified with different types of oral health personnel is given in the Council of Europe publication,[1] and this should provide guidance to those faced with the task of defining both general and intermediate educational objectives.

3.3.3 Specific educational objectives

These objectives should evolve by a process of discussion and consultation involving students, teachers, and other concerned groups. This collective approach is always important, but is especially so when new courses are being developed by teachers who have little experience of the conditions under which the newly qualified oral health worker will function. Examples of some specific educational objectives are listed

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[1] Role and training of auxiliary dental staff in the Member States of the Council of Europe and Finland. Strasbourg, Council of Europe European Public Health Committee, Coordinated Medical Research Programme, 1981.

below. At the end of a given course on common oral diseases, the student should be able to:

- name the two commonest oral diseases;

- describe in general terms the anatomy of the mouth in relation to teeth and gingivae;

- describe the natural history of periodontal disease and dental caries;

- distinguish between normal and uninflamed gingivae in a patient;

- distinguish between normal and decayed teeth in a patient;

- describe simply the etiology of periodontal disease;

- describe simply the etiology of dental caries;

- identify dental plaque and calculus;

- describe in general terms the composition of dental plaque and calculus;

- describe the role of dental plaque in the etiology of periodontal disease and dental caries;

- describe the inter-relations between the tooth and gingiva - the diet - dental plaque - time, and the common oral diseases;

- describe ways of preventing periodontal disease and dental caries including:

methods of oral cleaning
dietary controls
the use of fluorides

- demonstrate oral cleaning methods;

- list harmful foodstuffs and eating habits;

- prepare a demonstration of oral cleaning methods for a mixed age group of people;

- give oral health instruction to groups and individuals;

- give dietary instructions to mothers in relation to the feeding of their children;

- apply the material of this module to his or her daily work.

The achievement of many specific educational objectives may involve the following three fields: the acquisition of practical skills, e.g., the ability to demonstrate oral cleaning methods; the acquisition of communication skills, e.g., the ability to instruct groups and individuals concerning oral health matters; and the acquisition of intellectual skills, e.g., the ability to apply the material learned to his/her daily work. Some specific objectives involve only one set of skills, some two, and others all three.

Therefore, it is important that the component parts of each task are identified and considered during successive stages of the educational process. Both the learning process and the teaching activities involved should be designed to facilitate their assimilation and frequently the

three types of skills are intricately connected.[1] In brief they may be described in the following way:

(1) Intellectual ability (cognition):

- the ability to solve a problem;

- the ability to interpret data;

- the ability to recall facts.

(2) Attitudes:

- the ability to respond to the needs of another person;

- the ability to be receptive to the ideas of another person;

(3) Practical skills:

- the ability to perform certain acts automatically and accurately;

- the ability to exercise control over a practical skill;

- the ability to know when and how to apply a practical skill appropriately in a given situation

The following example illustrates the various component parts of one specific task. The specific objective is to anaesthetize the mandibular nerve with an inferior alveolar block injection using a 2% solution of lignocaine in an aspirating local anaesthetic syringe. This process must

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[1] GUILBERT, J.-J. Educational handbook for health personnel. Revised edition. Geneva, World Health Organization, 1981, pp. 1.37-1.41 (Offset Publication, No. 35).

achieve, at the first attempt, full anaesthesia of the area within one minute with no side-effects.

The intellectual ability required to fulfil the objective would include a knowledge of:

- the topographical anatomy of the area;
- the distribution of the inferior alveolar nerve;
- the mechanism of nerve impulse transmission;
- the pharmacology of lignocaine;
- drug interaction;
- microbiology and sterility.

In addition, before attempting to administer an inferior alveolar block injection a student should demonstrate his/her ability to:

- list from memory the measures to be taken to ensure sterility throughout the procedure;
- list from memory the medical conditions that contraindicate the injection of a 2% solution of lignocaine.

The attitudes required to fulfil the objective would include an appreciation of:

- the nature of fear;
- possible sources of anxiety;
- the lack of understanding among patients.

Before attempting to administer the injection, a student should demonstrate his/her ability to:

- list from memory the major factors that initiate the emotion of fear or apprehension in a patient;
- list the signs that may be observed in a patient who is apprehensive;
- reassure an apprehensive patient;
- explain the procedure to the patient without stimulating anxiety.

The practical skills required to fulfil the objective would include the ability to:

- safely sterilize an aspirating syringe;
- fit an appropriate sterile hypodermic needle to the syringe;
- recognize the appropriate cartridge of lignocaine solution;
- correctly insert the cartridge into the syringe;
- identify the surface markings and determine the correct point for needle penetration;
- insert the needle in the correct direction and to the appropriate depth;
- aspirate to ensure the safe positioning of the needle point;
- inject the correct quantity of lignocaine solution at an appropriate speed;

- recognize the stages as adequate local analgesia develops.

In lists of educational objectives it is essential to use words that have specific meanings and not words that may be ambiguous. For example, simply stating that students should "know" something may be interpreted in several different ways, e.g. should they recite, solve or construct? It is essential to state exactly what they have to do and the best way of doing this is to use the appropriate active verb. In general, a specific educational objective should be: relevant, logical, unequivocal, feasible, observable, and measurable.

CHAPTER 4

DESIGN OF EDUCATIONAL PROGRAMMES

4.1 Introduction

Although it is essential for reasons of clarity to separate the descriptions of the three components of an educational programme, namely design, implementation and assessment, in practice they are closely intertwined and cannot be considered in isolation. Indeed no programme can be designed without due consideration being given to the processes of implementation and assessment and their implications (see Chapters 5 and 6).

4.2 Modular versus vertical curricula

The overall hypothesis discussed in section 1.1 began with the phrase "Oral health care will be the responsibility of specially designed teams whose members will be trained together ..." This does not imply that various types of oral health students simply occupy the same building while all follow their own distinct curricula, but that curricula are integrated where appropriate and possible. There are two types of curricula:

(1) Vertical curricula - those in which educational objectives are defined with respect to the individual type of oral health personnel (or discipline) - to be trained.

(2) Modular curricula - those in which educational objectives are defined with respect to individual topics of study.

In a world in which oral health status is changing rapidly in various directions, students may have to become proficient in certain skills that may be irrelevant for their counterparts who enter the same institution in 10 years' time. Similarly, various categories of oral

health personnel may need to participate in retraining programmes to supplement their original skills once or perhaps several times during their working life. Traditionally vertical curricula have been used to educate health personnel but a study of the various types of job description given in the Council of Europe publication,[1] reveals that major overlaps occur, and that a modular approach to the design of curricula is both possible and desirable.

The modular approach has a number of advantages since it promotes:

- understanding and respect between the various members of the oral health team because they work together from the beginning of their education in oral health;

- flexibility in curricular design;

- the most economic use of teaching/learning resources;

- the most economic use of student time;

- individual appreciation of how to work and cooperate as a member of a team rather than as a lone operator;

- continuing education, not only within the various categories of oral health personnel but also as a result of movements of personnel to other categories.

However, a particular topic may be covered by more than one module according to the depth of knowledge required. A module may form the whole study of the topic for one type of student but be merely an introductory module for another type. The modules required by students

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[1] Role and training of auxiliary dental staff in the Member States of the Council of Europe and Finland. Strasbourg, Council of Europe European Public Health Committee, Coordinated Medical Research Programme, 1981.

must be appropriate not only for their future role but they must also relate to the students' previous experiences and existing knowledge. It is counterproductive to either underestimate or overestimate the level of any module. An example of the development of innovative designs is the trial of a performance simulation training programme being carried out by several universities and WHO[1,2] in which the modular approach is being used. Although only at the trial stage, this system has the exciting advantages of a preventive philosophy; a digital basis for all training, instrumentation, practice, and clinical records; a standard physical and equipment setting (see section 5.5.6.1); and a precise evaluation system.

4.3 Important factors in designing curricula

The four important factors for the design of educational programmes are discussed in this section.

(1) Cooperation. A programme designed jointly by a group of people in consultation with one another will probably be more successful than one prepared by an individual in isolation; no single individual can have the required breadth of knowledge and experience. Not only should there be extensive consultation within a school but there should also be discussions with, and help from, outside organizations, etc. Discussions with present students can be of great value not least because their involvement in the design of the curriculum stimulates their motivation to learn.

(2) Continuous revision. No design for an educational programme can be static and fixed; therefore it should not be a single operation but should be continuously revised. The concept of the educational

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[1] BOYD, M. A. & DONALDSON, D. First-year experience with a performance simulation system. Journal of dental education, 47: 666-670 (1983).

[2] MORGANSTEIN, W. M. Performance logic, the ultimate application. Journal of dental practice administration, 1: 31-34 (1984).

spiral, discussed in section 2.2, emphasizes this continuous process: designing - implementing - evaluating - redesigning, etc.

(3) Comprehensive coverage. As has been previously emphasized in section 4.2, for the development of a coherent and comprehensive programme it is necessary that the component parts are precisely defined.

(4) Specific concepts. General and abstract concepts form an inadequate basis for educational programme design. In Chapters 2 and 3, the need to define matters at various levels of detail was emphasized. Ultimately, whether or not a programme design succeeds will depend on the specific tasks defined as constituting its component parts.

4.4 Training teachers and programme designers

It is clear that action has to be taken at many different levels before a programme can begin. The derivation and formation of educational objectives have been discussed at length, but there has been no discussion on the training of teachers in education planning or on the need for research into the training of oral health personnel. Both areas are vital to the success of a programme, for without properly trained teachers relevant, effective, and efficient educational programmes cannot be developed. It is emphasized that the principles elaborated so far are general principles of education; therefore, wherever there is a faculty of education or a teacher-training programme there will be experts who will be able to help and advise. The WHO International Collaborative Oral Health Development Programme (ICOHDP) may also be able to help by providing teams of educators to undertake the training while nationals are being trained as teachers abroad or to provide teacher training as part of a specific project.

4.5 Educational research

As well as providing training for teachers of oral health personnel, a programme of educational research should also be instituted, the

objective being to determine the most effective and efficient way of training oral health personnel. Without research, educational programmes are unlikely to be reviewed and changed. Real problems in the education of oral health personnel are revealed when achievements are related to the means employed to attain them and the time taken. An essential component of educational research is thus concerned with the logging of the ways in which student time (and teacher or patient time) is spent. While frequent references have been made to the desirability of permitting students to progress through a learning programme at their own speed, it is rare to find a statement about determining how the time is spent. It is probable that this information may play a crucial role in curricular development, especially in the education of oral health personnel which involves instruction on how to deal with the management and organizational problems associated with the care of patients.

4.6 Planning teaching/learning activities

The available methods by which students might be helped in their learning are numerous and will be discussed further in Chapter 5. In general, these methods fall into one of two major groups:

(1) Methods used to present information to students: by the written word, e.g., text books, duplicated notes, published papers; by the spoken word, e.g., lectures (large groups), seminars (small groups); by demonstration.

(2) Methods used to guide students in their learning, i.e., feedback: the written word, e.g., essays corrected with comments, multiple choice questions marked; the spoken word, e.g., tutorials (individual or small groups); practical work, e.g., laboratory procedures and clinical care discussed critically.

Both methods become more effective if students are challenged by being required to solve particular problems.

Each learning method involves some form of communication through spoken, written, or practical exercises; all three methods of communication have an important role to play in the process of acquiring skills. However, it is essential to separate conceptually the two methods of learning, since it is often found that at a particular time one method may dominate the other or vice versa. For example, a curriculum may be dominated by the demands to present information: a given number of lectures; a certain number of hours, weeks, or years spent in laboratory or clinical work; defined reading requirement, etc. On the other hand, feedback is frequently provided only through formal examination procedures; and seminars can be confused with tutoring so that a small group of students may be "lectured", i.e., rather than the activity of the small group being student-centred (tutorial), it is teacher-centred (seminar).

The balance achieved in a programme between the various activities is of immense importance, but even within a particular course the right balance for each individual student will vary. To alleviate this situation a great deal of flexibility needs to be incorporated into each programme so that there is the maximum possible period of "elective" study, i.e., periods when each student is free to choose how to spend his or her time. This is particularly important for practical subjects such as those that predominate during the education of oral health personnel. While the solution of practical problems can be a great stimulus to learning, it is essential that practical skills are developed in parallel with the accumulation of theoretical knowledge.

In planning teaching/learning activities it is therefore essential not only to estimate the time needed to acquire the necessary knowledge and skills (i.e., meeting the educational objectives, defined for a particular topic or module), but also to find a balance between the methods available. How can this be done? It is a basic truth that the task will find the time available; furthermore, that teachers of speciality disciplines always reclaim more time than is available to them.

It is clear that these teaching/learning activities form an integrated whole, a balance between programme implementation (see Chapter 5) and evaluation (see Chapter 6). The planning of these activities is difficult. However, many experienced educationalists have expressed the opinion that within very broad limits most students succeed most of the time regardless of what their teachers plan or do for them.

CHAPTER 5

PROGRAMME IMPLEMENTATION

5.1 Recruitment and selection of students

Any educational programme depends on several factors: students to train; their previous knowledge, skills, and attitudes; the resources available for training; the resources for the provision of care; and the oral health problems to be solved. Nations and communities are organized in different ways socially, politically, and economically. Indeed major differences may occur within the same country. The method of obtaining a group of suitably qualified persons from whom a selection can be made will differ in different circumstances - not only will this reflect differences in national and/or community organization but also the level for which students are being selected.

In countries where there are not only great regional differences, but where these differences are enhanced by the separation of town and country, there is considerable evidence to suggest that if the primary health care approach is to succeed for the mass of the population, then local people must be involved in the local recruitment and selection of students. Those who do not understand the local ways and beliefs will be unacceptable to the population after training and they will frequently become alienated from their work.

A further difficulty is the problem of the social class origin of the students which, even within industrialized populations, can cause a considerable imbalance to develop between the services available to different socioeconomic groups in the population. Such differences cannot be explained solely by the attitudes of poorer people to oral health, but may also reflect the social class origins of oral health workers and the attitudes they acquire during training. Again it is important to consider the origins of those being selected if an attempt

is being made to extend primary oral health services to all population groups.

There are two principal approaches to recruitment that may be adopted. One defines entry requirements in terms of the knowledge, skills, and attitudes needed to follow the educational programme. The other selects those applicants with the highest academic qualifications - usually by the results of national school certifying examinations.

Both selection systems work. However the latter may be unnecessarily wasteful if the few really talented people in a nation are restricted to only a few specialist (professional) groups. The former system could result in a scarcity of dynamic, forward-thinking people in oral health; however, this method appears to be more universal in its application to the development of all types of educational programme for oral health personnel. Therefore, it is recommended that first minimal (and not necessarily maximal) entry requirements are defined in terms of the knowledge, skills, and attitudes needed to participate in the programme. It is important to remember that recruitment is not just a process of trying to find students who will do well.[1]

Having defined entry requirements, contact has to be established with the suitably qualified persons. This may be by the educational establishment itself or by the government or relevant ministry. The gathering together and informing of those qualified, the so-called recruitment process, will be a preliminary step in the selection process.

Basically, there are four requirements for this recruitment process: the "information package" must be attractive; it must be aimed at the appropriate target group; it has to be delivered to that group; any inquiry must elicit an encouraging response.

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[1] BENNETT, M. & WAKEFIELD, R. Selecting students for training in health care. Geneva, World Health Organization, 1983 (Offset Publication, No. 74).

5.1.1 The information package

The recruitment information that is circulated should include a discussion of the general aims and objectives of the education programme (see section 3.2) and should outline the future prospects and possible challenges envisaged after qualification. It is not uncommon for quite vague concepts to be presented, and yet many, or even most, potential applicants search not only for detailed information relating to a particular course but also for some indication of the possibilities following qualification such as different roles and further advancement. It is for this reason that the stages along a career pathway should be outlined to encourage the ambitious, the strongly motivated, and the more imaginative individuals to consider taking a particular direction. For example, it is unrealistic to hope that many really good candidates for training as dental chairside assistants would enter the profession if it involved a one-year course of training without the possibility of further advancement. On the other hand, if authorities planned that all recruits for training as dental chairside assistants should pass through all the available levels of further training, it is likely that the entry requirements demanded would eliminate a large proportion of candidates who are capable of serving in a more limited role.

The recruitment information provided should therefore include: guidelines on the basic entry requirements for the course; the length and content of the course; the future role in society of the qualified individual; the possibility of developing this role by further training; the potential remuneration available to the qualified individual in terms of job opportunities, future prospects, job satisfaction, standing in society, and financial reward.

The method that most successfully arouses initial interest will depend on the circumstances; however, personal contact is by far the most effective approach. Clearly, this personal contact cannot be with all the potential students but must be with those already in touch with groups of young people who are contemplating their future roles in

society, i.e., teachers, educational advisers, parents, and those already in the profession. However, such groups will need the help and support of dental educationalists who should provide detailed information in writing (or perhaps films). Dental educationalists must choose the form of help and support that is most appropriate to the particular local situation. In addition, potential students should be invited to meet the school staff; this visit should include, if possible, an opportunity to see the facilities available, such as laboratories, etc.

5.1.2 Target groups for recruitment

In many places oral health personnel tend to be selected mostly from relatively small sections of society and are in competition with very many other groups. It is essential for the reasons already discussed that these target groups are drawn from as wide a population as possible if any effective selection process and eventually services are to exist.

It is recognized (see Chapter 3) that the practical and caring aspects of dentistry play an important part in attracting individuals to the profession. While these characteristics are important for all oral health care personnel, a certain level of academic achievement is also important for dentists. Therefore, the recruitment target groups for dentists and auxiliaries will be different; in most cases, it is believed to be inappropriate for auxiliary personnel to proceed to dental undergraduate education other than through the usual channel.

The target group for dental undergraduates should be young people who have a high academic ability; otherwise, after qualification, it is probable that they will function more as auxiliary personnel than as leaders of the profession. Only rarely are individuals of reasonable academic ability unable to develop adequate operative skills. Not all the students will become outstanding operators, but then not all doctors are expected to become outstanding surgeons, and dentistry needs men and women with differing skills. The traditional concept of a lone operator,

interested only in technology, is now outdated. The leaders in dentistry need to have a much wider view of their role in society.

On the other hand, dental auxiliaries are not required to achieve comparable academic levels before they are accepted for training, but they should be interested and able to carry out practical procedures with tact, consideration, and patience. They, like dentists, require several skills. It is important that the training of dental auxiliaries is linked or stepped so that those most able are encouraged to accept increasing and wider responsibilities. However, the first step on this "ladder" of training must not be so high because of the academic qualifications required that it cannot be reached by many with other, possibly more valuable, skills. The question of whether tests of manual dexterity should be carried out is frequently raised. However, it is thought inappropriate to test a skill that has probably never been taught and is probably directly related to only a few of the skills to be acquired.

5.1.3 Circulation of the recruitment information

While the mass "advertisement" of courses is both essential and valuable as a basic first step, the most effective way of circulating information, as was discussed in section 5.1.1, is via individuals already in contact with potential students. The use or introduction of career advisers in schools should be considered since student discussion with such a person about a possible career in dentistry is worth many "advertisements". An advantage of this method of information circulation is that career advisers know their pupils. However, dentistry is a relatively small profession and therefore it is invaluable if teachers, parents, and career advisers, etc., are approached jointly by other related professions such as medicine, veterinary science, and the biological sciences.

5.1.4 The response to inquiry

Once the information has been circulated, it is very important that a kindly, interested, and helpful response is made to any inquiry regarding education and training in dentistry. Such a response should reflect the very qualities required of future health professionals. It has to be accepted that much effort will be wasted, or apparently wasted, in providing additional information, help, and guidance to young people who will never enter dentistry, but without this effort there is little hope of attracting the best candidates.

It should be remembered that this response begins with those who first receive an inquiry, such as telephonists, receptionists, or secretaries, for a kindly, interested reply can be invaluable while a curt, unhelpful reply will dissuade many potential students. The concern of the head of a school is essential for while some delegation will be necessary young people usually respond most favourably to time spent by the person "at the top". At times the speed of action can be very important in recruitment. It is important for young people to know that their inquiry or application has been received and that decisions will be made rapidly, as well as precisely what conditions, if any, are to be attached to any offer that is made. A speedy response confirmed in writing should be the rule.

5.1.5 Selection techniques

Much has been written about selection techniques and there has been considerable debate over the role of the interview. It now seems clear that interviewing as practised in many oral health educational establishments is at best a blunt instrument of decision-making and at worst possibly the most covertly biased of all techniques. If there are more appropriately qualified applicants than places, then random selection is as fair a technique of selection as the interview. To raise the minimum entry requirements at this stage is to deprive some

individuals of a career in the oral health professions and society in general of talented people who could be trained for other professions.

5.2 Timetables

Timetabling needs to be considered for each department and for the whole school. The school timetable creates the framework and, therefore, the essential character of the course, while the department timetable is operational in character and far more detailed.

5.2.1 School timetabling

In many countries, the first years of medical and dental undergraduate education are combined; in a similar way the provision of introductory courses for dental auxiliaries should be considered where possible; for example, an initial six-months' course in basic medical sciences, also attended by other students such as trainee pharmacy technicians, laboratory technicians, nurses, etc. Such an arrangement makes the best use of scarce teaching staff and helps students to appreciate their role as members of a wider health team. It will also help them understand community health needs during their career after qualification.

Timetables drawn up to organize students' and teachers' time are frequently complex, time-consuming, incomprehensible, and inconvenient. There are two essential principles that should be followed when drawing up a timetable:

(1) The clinical teaching commitment of each speciality should never swing from zero to excessive but rather be maintained at about the optimum level, being slightly increased or decreased only on the basis of long-term planning.

(2) A standard format should be created that might be applied to each situation, being composed mainly, though not exclusively, of

variable groupings of a minimum period of time, e.g., one session in the morning or afternoon.

An example of timetabling is given in Annex 2.

5.2.2 Department timetabling

It is not uncommon, even in larger schools, for very little detail to be available about the curriculum, and certainly a detailed timetabling of the curriculum is rarely recorded. A given subject, for example, preventive dentistry, will be the responsibility of a member of staff who will be informed of the times when certain sessions or lecture slots are available; this member of staff will be expected to publish a brief account of the course. When this individual is dedicated, capable, and imaginative, then such an arrangement can work, but usually only for the present and for that particular subject in isolation. While the first priority in the development of a course must be to define its overall aims and detailed objectives, as already discussed, the methods by which they might be achieved and the timing involved should be reflected upon and recorded. This record will highlight the following:

(a) the need to create the shape and character of a course long before it begins, i.e., the time required for lectures, seminars, laboratory or clinical work, monitoring, and how all these relate to one another;

(b) the ability to establish how a planned course has been modified as it proceeded;

(c) the creation of a document that will form the basis of a future course, with or without modification;

(d) the opportunity to advise staff, in particular new members of staff, about a course for which they will have a teaching responsibility;

(e) the opportunity to advise students of the structure of the course;

(f) the possibility of relating teaching in one discipline with that in another;

(g) the need to relate teaching requirements with available resources, e.g., laboratory or clinical space, instruments, lecture theatres, and audiovisual aids.

The many facets of teaching (whole group, small group, lecture, laboratory, clinical, elective) can make the detailed recording of a curriculum timetable a daunting task. However, it becomes manageable if a simple framework is created that can be applied to each teaching slot, as follows:

(a) Type of teaching: lecture, seminar, laboratory, clinical, elective.

(b) Period of time: 40 minutes, 90 minutes, etc.

(c) Size of group: whole year, eight undergraduates, six undergraduates plus two auxiliaries, etc.

(d) Type of teacher: lecturer, technician, auxiliary.

(e) Facilities required: clinical space, lecture theatre, laboratory, etc.

It has been recommended that curricula be generally defined in terms of topics rather than traditional dental departments, e.g., dental caries or periodontal disease rather than conservative dentistry or oral pathology. This does not imply that the departmental structure needs to mirror the division of the course into modules; it may do so in certain cases but this is neither essential nor practical. However, for a

particular topic to become established within a school it needs to be identified as such, e.g., oral diagnosis and the planning of care must be an essential component of every clinical specialty whether this be conservative dentistry, paediatric dentistry, oral and maxillo-facial surgery, etc., but if it is to be learned by students in the context of the general care of patients and be evolved as an important aspect of learning, a group of teachers must be identified with it.

Dental caries as a topic embraces important teaching commitments of the various relevant departments, such as community dental health, oral microbiology, oral pathology, conservative dentistry, paediatric dentistry, prosthetic dentistry, periodontology, orthodontics and cariology. Such departments can never embrace all these facets of the subject but they should be able to ensure that departmental teaching is related and complementary. Only when curriculum timetables have been created by each department does it become feasible to adjust them to avoid unnecessary repetition and to ensure that topics are presented as integrated studies.

5.3 Dental educational teams

Dental educational teams are identifiable in many different ways; each has at its centre an individual, a subject or discipline, or an activity. Each team is a "cogwheel" within the machine as a whole; the latter may function without one set of wheels but may be incapable of moving to a higher or more efficient gear. As changes and developments occur some "cogwheels" may become unnecessary in which case their retention can only increase the cost and decrease the efficiency of the machine as a whole. The following are examples of dental educational teams:

(1) Student-centred teams form the basis of the tutorial system and are composed of students, specialist teachers, and a tutor. Under this system each student is helped individually.

(2) Discipline-centred teams are usually given the title of department; the concern of each individual member of the team is to become an expert in that particular discipline, to advance knowledge within that field, and to pass on his/her skill and knowledge to others.

(3) Module-centred teams are comparable in many ways to the discipline-centred teams but their members are drawn from different departments, the topic itself not being given the title of a department.

(4) Course-centred teams are created with special responsibilities for various categories of students such as pre-clinical, junior and senior undergraduates, dental chairside assistants, dental hygienists, postgraduate students, etc.

(5) Patient-centred teams are perhaps the most complex of all being concerned with providing oral health care for patients and it is through these teams that so much of dental education is achieved. The members include lecturers, undergraduates, postgraduates, various dental auxiliaries (both qualified and in training, and clinical and laboratory based), and supporting staff including clerks or non-dental technicians.

(6) Evaluation-centred teams vary in nature; for example, a student-centred team may function as an evaluation-centred team, but formal examinations also depend upon a team of individuals working together but with one objective in mind, namely to assess the knowledge and expertise of a student.

Historically, the most influential types of team have been the discipline-centred, the course-centred, and the evaluation-centred. Teachers have tended to identify themselves as, for example, pre-clinical teachers in oral anatomy, with responsibilities to teach and examine undergraduate students in oral anatomy and carry out relevant research. There may be no contacts with postgraduate students or student auxiliaries, a responsibility for individual student progress may be ignored, and there may be no close contact with clinical teachers. When

considering the actual teaching or learning of dentistry it seems that the most important teams are student-centred, module-centred, and patient-centred. Many schools have tended to develop in line with the interests of departments and their staff rather than in the interests of education.

5.4 Tutorial systems

A tutorial system should be the heart of an educational system since it emphasizes student learning rather than teaching. The two processes of learning and teaching are frequently considered separately although clearly they form integrated parts of education. A tutorial group is composed of one tutor, a number of students and a number of teachers. The tutor and the students should form a stable group that is established at the beginning of the course while the teachers present will change as the course proceeds and as different topics are presented to the students. Thus, at any one time a dental undergraduate tutorial group might consist of a lecturer who is the tutor, up to eight dental undergraduates, and several teachers, each representing a specific area of study such as community dental health, conservative dentistry, dental materials science, paedodontics, oral medicine and periodontology, oral surgery, orthodontics, pathology, or prosthetic dentistry.

A tutor would not hold tutorials for the eight students collectively but the specialist teachers would dedicate much of their time to such group tutorials. However, a tutor should organize individual tutorials with each student; the number of these sessions for each student will depend on their progress, i.e., those students experiencing difficulties should attend more tutorials. The aims of group tutorials are that students should clarify their knowledge concerning a defined topic in the curriculum and teachers should assess the achievement of each student. The aim of the individual tutorial is to assess and manage the overall progress of each student.

To achieve this objective, a tutor needs to know and understand each of his or her students, including information such as academic and other achievements to date; background responsibilities carried and support given outside the school; attendance and amount of work covered; academic aptitude and progress; clinical or practical aptitude and progress; attitudes to patient care and other individuals; maturity of approach to professional responsibilities. Using such background knowledge a tutor and a student together are able to identify problems and difficulties and hopefully solve them, as well as plan the most appropriate, satisfying, and challenging course for the student.

While each institution will need to establish procedures to approve the actions to be taken in respect of each student, such as a decision by the dean or a college committee, the tutor should know better than any other the appropriate action to be taken in each case. Most decisions should be made on the advice of the tutor; the tutor will accumulate the ncessary knowledge from the assessment system (see Chapter 6).

5.5 Teaching facilities

The equipment and facility requirements of dental education are extensive, but their provision will always be limited by the financial and other resources available. What is ideal in one situation will not necessarily be ideal in another simply because it may be impossible to provide it. Clinical facilities can involve crippling costs, laboratories can be expensive and the provision of numerous seminar rooms is not cheap. Sadly, teaching/learning facilities are usually planned with an existing curriculum in mind, while particular individuals and departments tend to impose their own self-interested concepts. During the planning of a facility it is essential that the proposed curricula are carefully examined and that the costs involved in constructing and maintaining the required facility are determined.

Thus, if as part of a dental undergraduate course (intake of 50 students), a custom-built laboratory is created to accommodate these

students for teaching on manikin heads, it should be presumed that, however it is distributed throughout the course, approximately one year will be spent in such a place. If this is not the case then it must be possible to adapt the laboratory for the teaching of other subjects as well. Alternatively curricula should be designed in such a way that a much smaller laboratory is needed for small groups of students spread evenly throughout the year. To determine how many square metres of space will be required for a laboratory for teaching on manikin heads several questions will have to be answered:

(1) How many of each type of student will be involved?

(2) How many hours will each group of students need to use the laboratory?

(3) What group size will have to be accommodated?

(4) Will the teaching be in a "block" or integrated with other disciplines?

(5) Is it agreed that the facility may be multi- or uni-purpose? If the former, what are the characteristics of that teaching?

Clearly, if a department of conservative dentistry demands a laboratory to accommodate one whole student year for teaching, occupying the equivalent of only two months, an extensive and expensive facility would be idle for 10 months of the year. This cannot be reasonable but it is not uncommon in practice.

Obviously, it would be unreasonable and misleading to list the facilities required for student intakes of varying sizes for this would involve an assumption about the particular characteristics of the curricula to be followed. It is probably more important to discuss the general facilities that should be provided and that can be adapted to meet particular needs.

5.5.1 Library and tutorial space

A suitable quiet place should be provided with access to reference material so that each student can acquire theoretical knowledge at his/her own speed. The reference material or sources of information provided might include one or more of the following (depending on the resources available):

- duplicated texts produced by teaching staff;
- text books;
- scientific journals;
- doctoral theses;
- pathology specimens;
- photographic transparencies;
- tape recordings;
- video recordings;
- computer-stored learning programmes.

The technical developments of recent years have meant that computers are now within the financial reach of many more countries than previously and they should not be rejected out of hand as being a sophisticated expensive option. Text books and scientific journals, the traditional source of material, are now extraordinarily expensive; they are therefore limited in number within any institution, and in consequence relatively inaccessible. Furthermore, their expense makes them a security problem. It is for each institution to decide which are the most appropriate sources of information to be provided; but it must not be

forgotten that, text books and journals apart, the provision of the other material will largely depend on the efforts of the staff of the establishment, and the production of these materials is remarkably time-consuming. It is highly desirable therefore, not least in situations where funding is very restricted, to ensure that a small unit is established to provide the necessary technical support to assist the staff in the production of teaching material.

Sources of information need to be both reliably accessible and secure. A library soon becomes disreputable if a required text is very rarely available and this also leads to frustration. The staff of a department, frustrated by the unavailability of a required book or journal, soon resolve to establish a departmental library which, having limited access, secures for the privileged few a better service. Students are usually excluded from such places although it is they who really need access to the material.

While personal tutoring can and should be practised whenever possible in the intimacy of a tutor's own room, tutorials need more space than such places usually provide. Small tutorial rooms are infrequently included in the planning of accommodation and while it is possible to hold a tutorial in a corner of a larger room, such as a laboratory, it is both inconvenient and an expensive use of such space. Small rooms accommodating little more than chairs, a table, and power outlets are inexpensive and should be provided in adequate numbers.

5.5.2 Lecture theatres

At least one lecture theatre on the campus should be big enough to accommodate at the same time all the students whose courses contain a significant amount of common ground, e.g., dental and medical undergraduates, and dental undergraduates and dental auxiliaries. The need for additional smaller lecture theatres will depend on the types of personnel involved and the design of curricula. Audiovisual aids are developing in a variety of directions and include the unsophisticated

such as blackboard and chalk as well as the more sophisticated such as television monitors for demonstrations. The range of facilities provided will be determined by each school according to its needs, funding, and maintenance capability.

A lecture theatre with a raised or stepped auditorium can only be used for lectures, although the space beneath the auditorium may be used for offices, laboratories, or storage. An auditorium with a horizontal floor, raised rostrum and movable seating can have multiple uses in addition to that of lecture theatre. The choices open to any individual school will depend upon its funding, but, in general, it is wise to design buildings with the greatest reasonable flexibility, for tomorrow's needs could be quite different from today's.

5.5.3 General teaching laboratories

Flexibility is perhaps even more important during the design of laboratories than elsewhere. Multipurpose laboratories can be used maximally in any one year, but can also be changed for a different use in subsequent years, if necessary. These laboratories should have certain characteristics:

(a) be large enough to accommodate the maximum number of students the school may need to cope with at any one time;

(b) be easily and conveniently partitioned into smaller units to accommodate small teaching groups;

(c) be furnished with excellent basic non-specialized equipment including worktops, lighting, power, drainage, gas, suction, and compressed air;

(d) be provided with adequate and convenient storage for specialized needs, e.g., chemicals, manikin heads, instruments, or machinery;

(e) be supervised by one or more auxiliary staff appointed with specific responsibility for organizing the facilities of each laboratory, maintaining the equipment, and guaranteeing its security.

5.5.4 Dental technology laboratories

The special accommodation needs of dental technology require separate consideration. In addition to the demands of teaching there are the demands of production and the need for permanent accommodation for the personnel. The requirements for such laboratories must include the needs of the individuals who will work there such as:

- lecturers, especially those in prosthetic dentistry, conservative dentistry, and orthodontics;
- dental technician instructors with special expertise in various disciplines;
- dental students of varying degrees of seniority;
- students of dental technology with various degrees of seniority;
- some dental auxiliary personnel;
- staff dental technicians serving various departments;
- auxiliary laboratory staff.

While there is some attraction in separating the "service" role from the "teaching" role of a dental technology laboratory it is believed that the disadvantages of this separation outweigh the administrative advantages. The term team can be applied to the dental technology laboratory and this team should consist of an instructor dental technician, qualified dental technician(s), and student dental technician(s). Attached to this laboratory-based team will be one or

more clinical teams. Interaction or rather an integration of the two types of team will be required if both the educational needs of students and the service needs of patients are to be met.

The teaching needs of all types of students in the laboratory are very much those of an apprentice, i.e., the need to learn by example. It is, therefore, desirable that the laboratory environment is created in such a way as to facilitate the demonstration and observation of procedures. It is not enough simply to designate areas within a laboratory as appropriate for wax-work, plaster-work, metal-casting, polishing, etc.; the functional use of such procedures must be considered in a teaching context. Nor must the storage and issue of materials (plasters, waxes, resins, metals, etc.), of numerous items of equipment (e.g., articulators), or of items of work (crowns, dentures, models, etc.), be ignored. The concept of a laboratory teaching unit should be considered and be comparable to the dental care unit for clinical teaching (see section 5.5.6). Each unit should be self-contained and capable of functioning independently except for certain procedures such as plaster- and metal-casting or resin polymerization and polishing.

It is impossible, in this manual, to consider laboratory design in any detail since, in each case, the design chosen must match the particular situation in question. However, when considering a possible design for a laboratory teaching unit, it will be necessary to refer back to the curricula and timetables. It is right and proper first to seek answers to such questions as: how much dental technology should be learned by each type of student and can a clinician properly carry out surgery without personal knowledge and experience of the technical problems to be faced by the technician? The treatment needs of communities vary widely and therefore the nature of the dental teams, not least the laboratory-based team, will also be very different.

5.5.5 Other service and research laboratories

It is not possible to discuss in any detail the other types of laboratory facility that a dental school might need. Access to pathology services will certainly be required. These may be within the dental school or might equally well be provided by a larger general medical pathology laboratory. The long-term vitality of teaching is also very much dependent on an active research programme. Facilities that encourage research are therefore essential components of any planned dental school.

Not infrequently the first facilities to be provided are related to pre-clinical and para-clinical subjects, e.g., pathology laboratories are enlarged to accommodate histology, histochemistry, or electron microscopy. However, it is less common to find significant laboratory space or research staff dedicated to applied clinical research in its broadest sense. Such facilities are essential if teachers in many clinically-based disciplines are to fulfil their role as academics. The nature of such facilities will depend upon the special interests of the staff involved, but it should be emphasized that the necessary identification of some disciplines as being laboratory-based must not be equated with being research-oriented whilst other disciplines, seen as clinically-based are equated with being service- rather than research-oriented. The virtual absence of educational research (referred to in section 4.5) may be largely attributed to a general failure to encourage clinical teachers to carry out research by not providing them with adequate time or appropriate research facilities.

5.5.6 Teaching clinics

There are as many designs of teaching clinics as there are dental schools and almost as many as there are separate clinics within those establishments. It would therefore be presumptious to define any so-called ideal clinical environment and also it would most likely be soon out of date. Every dentist can describe the best possible clinical

design; unfortunately it is only the best design for himself or herself personally and not suitable for everyone.

Historically, clinical facilities in dental schools have consisted of operatories empty of instruments or materials, to which students take their patients and their own instruments and materials, etc. It is in these operatories that they work under the supervision of a member of staff. It is now believed to be desirable to design teaching clinics in such a way as to encourage the clinical team to function as a unit. The characteristics of such a clinical team or dental care unit will change to meet the teaching and safety requirements of different departments such as oral and maxillo-facial surgery, paediatric dentistry, or adult dentistry. These characteristics need first to be defined by those concerned and it is not possible, in this manual, to do more than describe the principles involved by the use of examples.

A dental care unit for adult dental health might consist of: 1 lecturer (dentist), 1 postgraduate dental student, 5 undergraduate dental students, 2 student dental hygienists, 1 qualified dental chairside assistant, and 2 student dental chairside assistants. The material and equipment needs of such a unit will be the following:

- waiting-room space for patients;
- consulting and patient education space;
- six operatories;
- instrument storage and sterilization facilities;
- materials store;
- records store;
- circulation and working space for dental chairside assistants.

The permutations and combinations of the many options are numerous, but it is very important that wherever materials or instruments are stored there must be one individual responsible for the proper maintenance of that store. If such stores are to be in the operatories then either a dental chairside assistant must be responsible for each operatory or each operatory must be allocated to a single (or at the most two) students exclusively. In general, such arrangements are too expensive, in which case the front-line store would provide materials and instruments for the entire dental care unit, i.e., in the above example one store would supply eight operatories and would be under the control of the qualified dental chairside assistant. If the sterilization and packaging of instruments is the responsibility of the dental care unit, the necessary storage space, work-top space, and accommodation for a variety of sterilizers must be provided. Alternatively, such services can be provided centrally and in this case there would only be instruments in the dental care unit during a particular operating session. The accessibility to each dental care unit of a central store, a central sterile supply department, patient waiting areas and reception, and dental laboratories, must be considered with care. This subject has been discussed previously.[1]

5.5.6.1 Design of the operatory. In a teaching clinic the operator working in each operatory may change many times in one hour; for example, an undergraduate examines the patient; the teacher examines; the student operates; the teacher helps; the student operates; the teacher assesses; the student operates, and so on. Then the student operator leaves and another makes use of that operatory. Therefore, the operatory must be suitable for:

- most types of operative procedure;

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[1] ALLRED, H. & MORGANSTEIN, S. I. An environment and organisation for patient care by dental students. British dental journal, 147: 127 (1979).

- various sizes and shapes of operators and assistants;

- left- and right-handed operators;

- operating alone and with close support;

- virtually instant conversion from one mode to another;

- easy access for an exchange of operator (student to teacher, etc.).

Many of these variables do not apply to general dental practice, only to the very special requirements of a teaching clinic. It is a paradox that many recent developments in the design of dental operatories include the need to fix the patient's head more or less in one place, with perhaps some vertical adjustment. Such a decision makes it inevitable that different operators will have to sit or stand in different positions in the operatory and consequently not only does the dental chairside assistant have to move around, but the instruments have to be delivered from a variety of positions. The result is enormous variations in the design of equipment (long arms, mobile units, suspensions from ceilings, etc.). If, however, the operator is visualized as operating from more or less the same position then all the requirements can be related to that position (wash-hand basin, instruments, dental chairside assistant, work-tops); the only requirement is that the patient's head can easily be positioned as required by the operator. This positioning of the patient's head might be achieved through the use of sophisticated and expensive patient couches that are adjustable vertically and horizontally as well as by rotation around the vertical axis. However, almost the same facility can be provided with minimum effort by using lightweight, broad-based patient couches with a box construction. Such couches may be moved by sliding and rotating them. Convenient arrangements for work surfaces,

instruments, etc., that meet the demands listed above can be created simply and economically or alternatively in more sophisticated and more expensive ways. The latter have been discussed previously.[1,2]

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[1] ALLRED, H. & MORGANSTEIN, S. I. An environment and organisation for patient care by dental students. British dental journal, 147: 127 (1979).

[2] MORGANSTEIN, W. M. Performance logic, the ultimate application. Journal of dental practice administration, 1: 31-34 (1984).

CHAPTER 6

EVALUATION OF EDUCATIONAL PROGRAMMES FOR ORAL HEALTH PERSONNEL

6.1 Introduction

The seventh component of the educational spiral (see section 2.2) concerns the evaluation of the educational programme; following evaluation the spiral divides.

(1) If the evaluation indicates that the educational objectives (Chapter 3) have been achieved within acceptable limits, the spiral turns inwards to component 8, namely the implementation of the strategies for oral health. In turn these strategies are evaluated (component 9) with reference to the origin of the spiral, namely the first component goals for oral health.

(2) If the evaluation indicates that the educational objectives have not been achieved within acceptable limits then the spiral takes the alternative pathway, returning to component 4 to initiate a new examination of the objectives (Chapter 3), the design (Chapter 4), and the implementation (Chapter 5).

The qualified personnel an institution produces can be considered to be the "products" of an educational programme. Therefore, evaluation can only begin with an assessment of the students' performance, i.e., to see whether or not they have achieved the educational objectives established for them. However, it is absolutely essential to distinguish this programme evaluation from the possible reasons for its relative failure or success. The main purpose of evaluation is to provide a basis for the value judgements needed in decision-making during the planning and implementation of educational programmes as well as to provide evidence that individual oral health workers are appropriately educated for their

future role in society.[1] Decisions need to be made frequently and therefore the data required for evaluation should be collected continuously, a process known as monitoring (see section 6.2.1).

6.2 Philosophy and aims of evaluation

Human behaviour is so complex that it cannot be described or even summarized in a manual of this type. The different behaviour patterns of different individuals are important but this information must be interpreted as a part of overall performance, not in isolation. Techniques of evaluation cannot be limited to written tests alone; the widest possible range of methods should be used to gain a better understanding of individual students, and so in turn to help them improve their understanding of themselves. However, the nature of the appraisal techniques used will influence the type of learning that takes place. Students who are constantly evaluated on factual knowledge will tend to assimilate more and more facts. To facilitate this process their own study and the efforts of their teachers will concentrate on achieving this objective. If a wide range of different methods of evaluation, each with a different objective, are employed then there will be more variation in the learning and teaching methods used in the course.

6.2.1 The basis of a monitoring system

The development of a monitoring system to be used for the assessment of students should be based upon the following:[2]

- individuals should receive the education that allows them to develop their own potential best;

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[1] KATZ, F. M. Guidelines for evaluating a training programme for health personnel. Geneva, World Health Organization, 1978 (Offset Publication, No. 38).

[2] DOWNIE, N. M. Fundamentals of measurement: techniques and practices. New York, Oxford University Press, 1967.

- individuals should be so placed that they contribute effectively to society and receive personal satisfaction from doing so;

- the full development of individuals requires a recognition of their essential individuality together with a rational appraisal by themselves and others;

- judgements required to assess individual potential are complex, difficult to make, and prone to errors; such errors can be reduced but never eliminated, hence no evaluation can ever be considered final;

- a composite assessment made by a group of individuals is more likely to be accurate than an assessment made by a single person;

- the efforts of a conscientious group of individuals to develop more reliable and valid appraisal methods will clarify the criteria for judgement and reduce errors and their consequences;

- every form of appraisal will be criticised; this should encourage change and improvement.

In practice, monitoring is used to determine whether students have achieved the required educational objectives by answering certain basic questions:

(a) Is the educational programme itself appropriate and adequate?

- are the educational objectives well defined and proper?

- is the programme design reasonable?

- can the programme be implemented under the prevailing circumstances?

(b) Are the teachers effective?

(c) Are the students performing adequately?

6.2.2 The aims of student assessment

The development of an evaluation programme is the responsibility of teachers, administrators, and students. Only when all concerned participate will the evaluation programme have maximum value. There are three basic aims of student assessment:

(1) To determine whether or not the students have succeeded in achieving the stated educational objectives and thus to:

- protect society;

- secure good public relations.

(2) To provide feedback to students by comparing their achievements to an established norm:

- as an incentive to learning;

- to stimulate modifications in learning activities.

(3) To provide feedback to teachers by comparing student achievements to an established norm:

- as an incentive to teaching;

- to stimulate modifications in teaching activities;

- to provide data for student selection.

6.2.3 Psychological aspects of student evaluation

During the planning of student evaluation certain psychological aspects should be taken into account:

(1) For evaluation to be most effective, it should consist of the best possible techniques used in accordance with the most effective psychological principles;

(2) Readiness has been long recognized as an important prerequisite for learning; students are ready when they understand and accept the values and objectives involved;

(3) People are motivated towards activities identified with success and students associate certain behaviour with success, e.g., if exams are a test of memory then students become memorizers; alternatively, if exams require the application of principles, the interpretation of data, and the solving of problems, then students will study appropriately. Therefore, the method of assessment greatly influences the type of learning that takes place;

(4) Individuals tend to learn better when they are frequently informed of their progress;

(5) Student motivation is of paramount importance; their actual achievement will approach their maximum potential when their motivation is high;

(6) The active (as distinct from passive) involvement of a student in an exercise assists learning.

6.2.4 Categories of evaluation

It is clear that evaluation falls into two main categories: formative or diagnostic evaluation, which provides students with

information on their progress; and certifying or summative evaluation which is mainly concerned with protecting the public. It is essential that evaluation is seen to contribute in a very positive way to the whole educational process but it must not dominate by making qualifications the essence of the programme, thus pushing instruction, teaching, and all other learning experiences into the background. A major responsibility of teachers is to explain to students the wider aims of their course and there is a danger that too frequent assessments will be viewed by students as "hurdles" to be cleared and will inevitably be their main concern. Furthermore, should a "hurdle" not be cleared there is a penalty, and this further encourages such concepts.

6.2.4.1 Formative evaluation. Formative evaluation should be designed to:[1]

- inform students of what remains to be learned if their educational objectives are to be achieved;

- measure the progress or gains made by students throughout their course;

- enable learning activities to be modified in response to achievement or lack of achievement;

- avoid the possibility of certifying judgements being made as a consequence;

- be controlled by the students themselves;

- encourage students to seek and be given guidance;

- be available to students on their demand;

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[1] DOWNIE, N. M. Fundamentals of measurement: techniques and practices. New York, Oxford University Press, 1967.

- provide teachers with the qualitative and quantitative information required to indicate the need for changes in teaching.

6.2.4.2 Certifying evaluation. Certifying evaluation should be designed to:

- protect society by preventing incompetent personnel from qualifying:

- provide data on student progress to be used to make decisions about further study.

6.3 Methods of evaluation

There are four basic steps to be taken in student evaluation:

(1) Identify the educational objectives that are to form the basis of the assessment (Chapter 3); specific objectives (see section 3.3.3) will define the acceptable levels of achievement;

(2) Define the most appropriate tests to be used in the assessment;

(3) Determine the basis on which the results of these tests will be interpreted and judged;

(4) Make judgements and determine the appropriate action to be taken.

In section 3.3.3 three types of skill were discussed, namely intellectual ability, communication ability and practical skills. During evaluation, each class of skill needs to be assessed as appropriate. Traditionally in oral health education most emphasis has been placed on two of these skills, namely intellectual ability and practical skills, and rarely is an attempt made to evaluate the third,

i.e., affection, attitude, and the ability to communicate. An example of one way of measuring this third category of ability is given in Annex 3.

For all the subjects studied in dentistry, each method for assessing students' knowledge and communicating or manual skill has a strong subjective component. Possible assessment methods include:

- written essay-type answers to questions;
- written short answers to a series of consecutive and related questions (linked structure of questions);
- written selected answers to multiple-choice questions of different complexity;
- oral examinations;
- oral examinations relating to the examination of a patient or a histological or other specimen;
- the identification of a series of items;
- the observation and examination of practical clinical tasks.

No single test (objective, essay, or oral) can satisfactorily measure the higher and more complex intellectual processes; therefore many or all of these methods should be used as appropriate. This is one of the major functions of the tutorial system (see section 5.4) for within the tutorial group most of these methods will be employed at one time or another, especially for formative evaluation (see section 6.2.4.1). In addition, the tutorial group can and should have a role to play in the process of certifying evaluation (see section 6.2.4.2), since it is the tutorial group more than any other that can provide information concerning a student's knowledge and ability. However, there is a paradox; while such a group is more likely to make an accurate

evaluation of a student than a single individual, its very size means that it will probably include relatively inexperienced assessors. Inexperience tends to produce neutral judgements, i.e., the student will be judged as not bad, not good, but just about satisfactory. The presence of a number of very experienced individuals at decision-making conferences is, therefore, essential. Some advantages and disadvantages of different types of test are presented in Tables 1-4.

Table 1. The advantages and disadvantages of oral examinations

	Advantages[a]		Disadvantages
1.	Provide direct personal contact with candidates	1.	Lack standardization
2.	Provide opportunity to take mitigating circumstances into account	2.	Lack objectivity and reproducibility of results
3.	Provide flexibility in moving from candidate's strong points to weaker areas	3.	Permit favouritism and possible abuse of the personal contact
4.	Require the candidate to formulate his own replies without cues	4.	Suffer from undue influence of irrelevant factors
5.	Provide opportunity to question the candidate about how he arrived at an answer	5.	Suffer from shortage of trained examiners to administer the examination
6.	Provide opportunity for simultaneous assessment by two examiners	6.	Are excessively costly in terms of professional time in relation to the limited value of the information obtained

[a] Unfortunately these advantages are rarely used in practice.

Table 2. The advantages and disadvantages of practical examinations

	Advantages		Disadvantages
1.	Provide opportunity to test in a realistic setting skills involving all the senses while the examiner observes and checks the performance	1.	Lack standardized conditions in laboratory experiments using animals, in surveys in the community, or in bedside examinations with patients who are more or less cooperative[a]
2.	Provide opportunity to confront the candidate with problems he has not met before in both the laboratory and the dental operatory and to test his investigative ability as opposed to his ability to apply ready-made "recipes"	2.	Lack objectivity and suffer from intrusion of irrelevant factors
3.	Provide opportunity to observe and test attitudes and responsiveness to a complex situation (videotape recording)	3.	Are of limited feasibility for large groups
4.	Provide opportunity to test the ability to communicate under pressure, to discriminate between important and trivial issues, to arrange the data in a final form	4.	Entail difficulties in arranging for examiners to observe candidates demonstrating the skills to be tested

[a] Standardized practical tests can be organized. See Educational strategies for the health professions. Geneva, World Health Organization, 1974, pp. 18-34 (Public Health Papers, No. 61).

Table 3. The advantages and disadvantages of essay examinations

Advantages	Disadvantages
1. Provide candidate with opportunity to demonstrate his knowledge and his ability to organize ideas and express them effectively	1. Limit severely the area of work that can be tested
	2. Lack objectivity
	3. Provide little useful feedback
	4. Time-consuming for the marking

Table 4. The advantages and disadvantages of multiple-choice questions

Advantages	Disadvantages
1. Ensure objectivity, reliability, and validity; preparation of questions with colleagues provides constructive criticism	1. Take a long time to formulate in order to avoid arbitrary and ambiguous questions
2. Increase significantly the range and variety of facts that can be tested in a given time	2. Require careful preparation to avoid a preponderance of questions testing only recall
3. Provide precise and unambiguous measurement of the higher intellectual processes	3. Provide cues that do not exist in practice
4. Provide detailed feedback for both student and teacher	4. Are "costly" where the number of students is small
5. Are easy and rapid to mark	

Studies of various types of test suggest that the essay and the oral examination, so commonly employed in oral health education, test mainly simple recall and rarely require students to reason and solve problems. Indeed there is a tendency to confuse the difficulty and complexity of a question with the nature of the intellectual process being tested. A question requiring simple recall may be termed difficult because of the detailed information demanded; alternatively, a question requiring the interpretation of data or the application of principles might seem to be quite easy because the principles of interpretation involved are so familiar and the data to be analysed so simple.

It is often assumed that a question that includes data about a specific example (written, a radiograph, or a patient) necessarily involves problem solving. In fact the question may be really concerned with a general principle and could be answered equally well without reference to the data. Alternatively, the data provided with such an example may simply be a classical textbook picture requiring students to recall facts associated with a specific situation. Questions of this type can in fact readily be converted into problems that do require the interpretation and evaluation of data, simply by making the case material conform more closely to reality instead of being a textbook presentation. During the selection of the most appropriate tests the following should be considered:

(1) Validity - the extent to which the test measures what it is intended to measure;

(2) Reliability - the consistency with which a test measures a given variable;

(3) Objectivity - the extent to which independent and competent examiners agree on what constitutes a good answer for each of the elements of a test;

(4) Practicability - the overall simplicity of the test used, both for the examiner and for the students.

The application of these principles to the development of training programmes and assessment systems for oral health personnel is not difficult, but it takes time since the processes of evaluation and programme planning never cease.

6.4 Guidelines for the evaluation of existing oral health education programmes

The guidelines, summarized from two WHO publications[1,2] take the form of a series of operations, not necessarily in order, to be followed by an evaluator. It is essential that information is constantly re-examined, questions are re-phrased, steps are retraced, and judgements are revised.

The evaluation procedure may be considered under four headings: orientation, design, information, analysis and report, as follows:

(1) Orientation

- determine the general characteristics of the teaching programme;

- ascertain the general characteristics of the administrators, teachers, and students;

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[1] GUILBERT, J. J. Educational handbook for health personnel. Revised edition. Geneva, World Health Organization, 1981 (Offset Publication, No. 35).

[2] KATZ, F. M. & SNOW, R. Assessing health workers' performance. A manual for training and supervision. Geneva, World Health Organization, 1980 (Public Health Papers, No. 72).

- determine the financial resources available for the programme as well as the existing facilities;

- clarify the aims of the proposed evaluation;

- make an inventory of what information is readily available about the teaching programme;

- determine the resources available for the evaluation and fix a time-limit for its completion;

- clarify the evaluator's role and that of the other participants;

- make a preliminary appraisal of the nature and feasibility of the proposed evaluation.

(2) Design

- list the questions and issues to be considered;

- determine the appropriate sources of information and the procedures for its collection;

- design the evaluation process;

- draw up an evaluation schedule;

- draw up an evaluation budget;

- obtain feedback on the evaluation design, schedule, and budget.

(3) Information

(a) Context

- describe briefly the context in which the programme operates.

(b) Objectives

- list the future functions, taking account of the main health problems and the tasks and responsibilities deriving from each;

- list the training objectives, taking into account the principal tasks the student should be able to perform satisfactorily at the end of his training.

(c) Characteristics of enrolled students

- ascertain characteristics that are likely to affect student performance as learners and subsequently as health workers;

- gather information about the students at the beginning of their training;

- make a summary of the characteristics of the student group(s).

(d) Resources and training procedures

- make an inventory of the resources available for the programme and describe how they are allocated;

- examine and record the training procedures used in the programme;

- make a summary of information relating to students' experience, using as themes the principal tasks and role models.

(e) Effects and impact of the programme

- ascertain the effects of the programme that are to be evaluated;

- describe and make a critical examination of the assessment procedures already in use in the programme;

- if those methods are not adequate for the purposes of the present evaluation, develop and apply others;

- work out a set of procedures for observing and describing the long-term impact of the programme, if that is to be evaluated.

(4) Analysis and report

- prepare a concise description of the programme using the information gathered during (3) above;

- analyse the relationship between the various aspects of the programme;

- prepare an evaluation report summarizing the qualities and achievements of the programme, the problems and difficulties of implementation, and the available options or courses of action for its improvement.

6.5 Adapting oral health education programmes in line with community needs

An important objective of making changes in a health education programme should be to improve its effectiveness in helping future oral health workers to meet the oral health needs of the communities in which they will work, i.e., to ensure the integrity of the educational spiral (section 3.2) by relating educational objectives to the goals for oral health. Examples of questions that might be asked to assess the extent of this relationship are given below.

Each of the main questions listed below must be answered in one of the following ways:

(a) Yes - I have good reason to believe so, and I have even obtained some evidence to that effect.

(b) No - I do not think that is true.

(c) +/- - It is very possible, but I have no facts to prove it.

(d) ? - I am unable to reply to the question.

Questions

(1) Are the changes in the government's priorities concerning oral health care more clearly understood by the programme planners inside the school?

(2) Does the school now respond more swiftly and appropriately to any changes in national planning and priorities?

(3) Does the school now work more harmoniously with the relevant government agencies and the population?

(4) Is direct feedback from the performance of (recent) graduates used as a criterion in assessing the strengths and weaknesses of the (new) curriculum? Is the school responsive to this type of feedback?

(5) Are the various schools for oral health personnel within the national system learning from one another and assisting one another to reproduce successful changes and progressively eliminate those that do not seem so successful?

(6) Is the course content of the programme relevant to the common oral health problems of the country? How could it be made more relevant?

(7) What observable changes have taken place in:

- patterns of morbidity;

- the responsiveness of the population to the prevention of oral disease. Could such changes be the result of the programme changes?

(8) Are consumers more satisfied with the quality of oral health care delivered by the oral health personnel trained according to the (new) programme?

(9) What are the principal forces that have accelerated the processes of realistic valuable programme change and development? What have been the major restraining forces on development? How might accelerating forces be strengthened and restraining forces altered?

6.6 Student evaluation of programmes, teaching techniques, and teachers[1]

An evaluation made by students can provide teachers with useful feedback on the quality of their teaching. Anyone who genuinely wishes to improve their teaching abilities should therefore seek students' opinion. This may be done simply by a friendly talk with a few students, but it is preferable to prepare and distribute a questionnaire. Such an evaluation questionnaire may cover the whole or only part of the teaching programme, and it is for the teacher together with the students to decide which areas should be evaluated. It would, for instance, be very valuable for a teacher to know how the students regard any changes in theteaching routine, such as organizational change or the introduction of audiovisual material. Anyone who asks students to evaluate their teaching need not doubt the validity of student judgement. For a decade or so many psychometric studies have revealed the validity and the accuracy of student opinions as well as their close correlation with objective measurements of the instructor's effectiveness. The many biases ascribed to students in the past, for example, the influence of sex, academic efficiency (poor students/good students), level of studies (beginners/finishers), the status of the course (compulsory/optional) have all proved to be of negligible importance.

The teaching aspects to be evaluated are first determined, then the evaluation questionnaire is drawn up. The preparation and administration of evaluation questionnaires has been discussed in a previous WHO publication.[2]

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[1] Based on a paper presented by J. F. d'Ivernois on 21 May 1975 at the Seminaire de Pédagogie Universitaire at Laval University, Quebec, Canada.

[2] GUILBERT, J.-J. Educational handbook for health personnel. Revised edition. Geneva, World Health Organization, 1981, pp. 4.15-4.18 (Offset Publication, No. 35).

Annex 1

EXAMPLES OF GENERAL EDUCATIONAL OBJECTIVES

Two alternative lists of general educational objectives are given below:

First list

The graduates of a dental training programme should be able to:

(1) Identify all aspects of oral health problems and to collect, process, and present data that is relevant to these problems; and to resolve and manage these problems for the individual, the family, or the community.

(2) Diagnose and manage oral diseases that occur frequently in the community (including emergencies), to identify and provide primary care for serious diseases, taking into account the physical, emotional, and social aspects of these conditions.

(3) Manage oral health centres at various levels and in a variety of settings and to work effectively and efficiently in health teams, in teaching, research, and service, making use of the available facilities.

(4) Apply basic principles of oral health education to assist and direct the planning, implementation, and evaluation of oral health programmes for the promotion of oral health, prevention of oral disease, as well as for the cure and rehabilitation of patients, according to the needs of the community and the local social, religious, customary, and cultural values that may influence the health of the population.

(5) Identify their own personal limitations and assets, and thus by nurturing their capacity and interest to enhance their knowledge and to

develop the personal characteristics required for professional advancement.

(6) Function as an effective and efficient member of a team with a sense of responsibility and dependability.

Second list

At the end of his/her dental training the graduate will have acquired or developed the knowledge, skills, and attitudes necessary to qualify for further education in any dental or related health career. The attainment of the general educational goals should enable a student:

(1) To identify and define oral health problems at both the individual and community level and to search for information to resolve or manage these problems.

(2) To examine the underlying physical, biological, and behavioural factors that influence oral health problems. This includes a spectrum of phenomena from the molecular level to the social level which includes the patient's family and the community.

(3) To investigate community oral health problems and to recommend efficient and effective ways of dealing with environmental, occupational, behavioural, and public policy issues.

(4) To develop the clinical skills and methods required to define and manage the oral health problems of patients, including their physical, emotional, and social aspects, within the context of effective health care.

(5) To recognize, maintain, and develop the personal characteristics and attitudes required for a career in a health profession. These include:

(a) awareness of personal assets, limitations, and emotional reactions;

(b) responsibility and dependability;

(c) ability to relate to, and show concern for, other individuals.

(6) To be a self-directed learner, recognizing personal educational needs, selecting appropriate learning resources, and evaluating personal progress.

(7) To assess critically professional activity related to patient care, health care delivery, and health research.

(8) To function as a productive member of a small group that is engaged in learning, research, or health care.

(9) To work in a variety of health settings.

Annex 2

AN EXAMPLE OF TIMETABLING

The following example is intended to form the basis for a consideration of timetabling. The characteristics of this particular example are:

(1) Teaching in small groups, 8 students in each group.

(2) Eight groups in one student year.

(3) Units of time as a basis of small-group teaching, i.e., morning/afternoon sessions of 3 hours.

(4) Ten units of time per week (5 days).

Matrix

Discipline	Monday		Tuesday		Wednesday		Thursday		Friday	
	am	pm	am	pm	am	pm	am	pm	am	pm
A	1.1	1.2	1.3	1.4			1.5	1.6	1.7	1.8
B	1.8	1.1	1.2	1.3			1.4	1.5	1.6	1.7
C	1.7	1.8	1.1	1.2			1.3	1.4	1.5	1.6
D	1.6	1.7	1.8	1.1			1.2	1.3	1.4	1.5
E	1.5	1.6	1.7	1.8			1.1	1.2	1.3	1.4
F	1.4	1.5	1.6	1.7			1.8	1.1	1.2	1.3
G	1.3	1.4	1.5	1.6			1.7	1.8	1.1	1.2
H	1.2	1.3	1.4	1.5			1.6	1.7	1.8	1.1
I					1.0					
J						1.0				

The numbering of each student group 1.1 to 1.8 simply identifies the group, for example, group number three of the first year would be 1.3; this same group would become 2.3 during their second year of study and 3.3 in their third year, etc. Group 1.0 includes all the first-year students (64). Thus, for disciplines I and J the whole student year would be present at the same time, e.g., in the microbiology laboratory, or it may be a period set aside for elective study, or extra-curricular activities. Although eight disciplines (A-H) are given in the example, two or more of these might be the same subject and some sessions may be free for elective study.

The example given fits neatly into this matrix because eight groups have been assigned in turn to eight sessions. If the total student number were more than could properly be divided into eight groups then each discipline would need to accept two groups at some time; if fewer than eight groups were to exist then each discipline would be free of teaching for one or more sessions each week.

For central management the disciplines identified might well embrace more than one subject, e.g., paedodontics and orthodontics might be jointly identified as child dental health, and operative dentistry and endodontics as conservative dentistry. Then, within the discipline the scheduling of the commitments can occur introducing great flexibility without confusion.

However, such a matrix does require a steady, even commitment of disciplines and, should this be impossible, it may be necessary to split the timetable for one period into two halves; say mornings and afternoons, as shown below.

Morning or afternoon

Discipline	Monday	Tuesday	Wednesday	Thursday	Friday
A	1.1	1.3		1.5	1.7
	1.2	1.4		1.6	1.8
B	1.3	1.5		1.7	1.1
	1.4	1.6		1.8	1.2
C	1.5	1.7		1.1	1.3
	1.6	1.8		1.2	1.4
D	1.7	1.1		1.3	1.5
	1.8	1.2		1.4	1.6
E			1.0		

The various ways in which such matrices can be applied are considerable and their use permits detailed changes to be introduced to meet the particular needs of a discipline while avoiding the disruption of other commitments.

Such a timetable need not, indeed should not, occupy the whole academic year. While one or more disciplines might be defined as free or elective periods within it, the timetable itself should operate only for relatively short periods of time, e.g., ten weeks, so that the 52 weeks of each year might be divided as shown below.

Term 1	-	10 weeks
Interterm 1	-	4 weeks
Term 2	-	10 weeks
Interterm 2	-	4 weeks
Term 3	-	10 weeks
Interterm 3	-	14 weeks

During the interterm periods elective study, research projects, and continuing general clinical experience may take place.

Within the example given above, whole group teaching may be provided whenever the entire student year is indicated (i.e., 1.0) but additional short periods may also be set aside for lectures, etc. Thus, although the "sessions" have been defined as being 3 hours in length, e.g., from 09.00 to 12.00 and 14.00 to 17.00, lectures could be arranged at 08.00, 12.15, or 17.15, as required.

The greatest danger in timetabling is to arrange that every moment of each day is filled with a defined commitment. It is a strange contradiction that a department whose staff consider their teaching commitment to be excessive will, without hesitation, increase that commitment if advised that student time is available if they need it. Needless to say, the timetables for all the student years (1st, 2nd and 3rd) must be superimposed upon each other -- to identify any department's total commitment. Furthermore when different types of personnel are being trained together all the timetables must be considered so that departments may assess their commitments and organize these at a departmental level.

Annex 3

ATTITUDE MEASUREMENT

The term "attitude" refers to certain regularities or consistencies of an individual's feelings, thoughts, and predispositions to act in response to an aspect of his/her environment. Attitudes cannot be directly observed but they can be inferred from speech or outward behaviour.[1] However, the measurement of attitudes is very difficult.

Scales are utilized to evaluate reactions, attitudes, and student activities, but the many sources of error in such evaluations are often overlooked.

An example of one way of measuring attitudes is given below:

The method:

1. Make a list of observable types of behaviour showing that the objective pursued has been reached.

2. Make a list of observable types of behaviour showing that the objective pursued has not been reached.

3. Determine the essential features of behaviour in both lists.

4. Assign a positive or negative weight to the items on both lists.

5. Decide on the acceptable performance score.

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[1] GUILBERT, J.-J. Educational handbook for health personnel. Revised edition. Geneva, World Health Organization, 1981, p. 4.23 (Offset Publication, No. 35).

For stages 3-5 obtain the agreement of several experts.

Example. Objective: To measure how competently a student reassures the mother of a child who is to receive emergency dental treatment in a dental clinic:

Attitude	-2	-1	0	+1	+2
Explain clearly what is to be done to the child	Often uses dental terms and never explains what they mean	Often uses dental terms and rarely explains what they mean	Rarely uses dental terms and sometimes explains what they mean	Rarely uses dental terms and always explains what they mean	Uses only terms suited to the mother's vocabulary

Clearly the list could be extended to include other aspects (e.g., what is the likely outcome). Minimum performance: the student should score "n" marks out of 10 on the rating scale (collective discussion should determine what "n" should be).

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